THE CSS BOOKS
TODAY A READER TOMORROW A LEADER

Notes

EVERYDAY SCIENCE

By: NOA

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Take Your Dreams Off The Shelf

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Biology

Prepared by

Muhammad Atif Ali

Mohammad Aslam Korejo-
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Bio means life and logy means study, so biology means "study of living organisms".

Branches of Biology

values and -dif-
components of News

Botany: Study of plants.

Zoology: Study of animals.

Microbiology: Study of micro-organisms like bacteria etc.

Cytology: Study of structure and function of cells.

Physiology: Study of different parts of the body.

Ecology: Study of relationship between organisms and environment.

Taxonomy: Study of classification and naming of organisms.

Genetics: Study of inherited characters from parents to offspring.

Paleontology: Study of fossils.

Biotechnology: Study of the use of living organisms for the welfare of mankind.

Entomology: Study of insects.

Ornithology: Study of birds.

Mammalogy: Study of mammals.

14 **Odontology:** Study of teeth.

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0322-3045013

(Tests) EDS
saturday 26-6-2009
Instruments : 50
Scientist : 10
units : 50

(English)

Mastering the world of English
Mirza M. Yousif

Qoutational books

(1) Authentic Essay

(2) Sundry reflection

MCQs (History of cell)
Short Note (5 Marks
Difference (2 Marks)

Cell

Prepared by
Muhammad Atif Ali

Definition:

"Cell is the structural and functional unit of life"

History of Cell:

Cell was discovered by Robert Hook in 1665 when he was studying a thin section of cork under his self-made microscope. In 1831, Robert Brown reported the presence of nucleus in the cell.

Two German scientists Schwann and Schleiden in1839 formulated cell theory.

Old Theory of cell ⇒ There were three main points of cell theory. Cell is composed of three parts.

1) Outer membrane
2) The fluid surrounding the nucleus (Cytoplasm)
3) Nucleus, which is present in the centre of cell.

Modern Theory of cell 1960 ⇒ After that many changes were made in cell theory. In the present form, cell theory consists of following main points.

1) All organisms are composed of one or more cells.
2) All cells arise from pre-existing cells ⇒ New cell are formed from pre-existing cell.
3) Cell is the basic structural and functional unit for all organisms.

Structure of a generalized cell:

Cell consists of following parts

Cell membrane: / Plasma / ~~specific~~ specific permeable membrane

- It is the outer most layer in animal cell while in plant cell it is covered by cell wall.
- It is composed of 60-80% protein, 20-40% lipids (Fats) and a small quantity of carbohydrates.
- Protein molecules are embedded in lipid bilayer, this model is called Fluid Mosaic model.
- Functions of cell membrane ⇒ It helps in the transport of material., Protect and separates from outer envi men
- It acts as barrier between the cell contents and the environment.
- It is known as selectively permeable membrane (only specific substances are allowed to enter through specific pores).

short note

2) Cytoplasm: component → 90% water → cell organelles ↓ mitochondria → Endoplasmic reticulum

- (1) Cytoplasm consists of an aqueous material containing cell organelles, insoluble wastes and soluble part.
- (2) Cell organelles include Endoplasmic Reticulum, Golgi Complex Mitochondria, Ribosomes, Plastids etc.
- (3) Insoluble wastes includes Calcium, Cellulose other nitrogenous waste products.
- (4) Soluble part is also called Cytosol. Which is further divided into two parts
    1. Sol is the non-viscous, true solution. ~~Thick~~ Thin
    2. Gel is the viscous, colloidal solution. Thick
- Over all cytoplasm is composed of 90% water.

3) Endoplasmic reticulum (ER):

- It is a network of channels (tubes) extending from nuclear membrane to the cell membrane.
- The walls of these channels are called Cisternae.
- They are of two types.
- Functions of ER. Rough ER on which Ribosomes are attached. They are involved in the synthesis of proteins. main Function
- Smooth ER are without Ribosomes. They are involved in the (1) metabolism of lipids, detoxification of harmful drugs and transport of material from one part of the cell to other parts. to out useless material

4) Golgi Complex or Golgi Apparatus:

- It consists of membrane bound sacs called cisternae and vesicles.
- Cisternae are continuously formed by the fusion of vesicles which are budding off from Endoplasmic Reticulum.
- Functions → Protein which is synthesized on the RER, is transferred to Golgi Complex where it is converted into finished products and are exported outside the cell or within the cell where it is necessary.
- It also modifies the lipids by adding carbohydrates to it.

5) Lysosomes: Lyso → ~~split~~ splitting = Somes = body

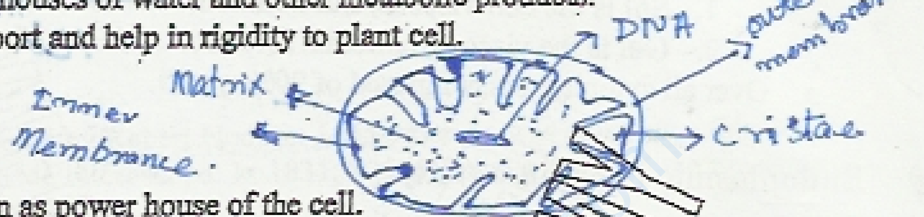
- Lysosomes are secreted by Golgi complex.
- They are also known as splitting bodies ("Lyso" means splitting and "Soma" means Body).
- Function → They contain special proteins (enzymes) which are used to break down any harmful foreign particles or bacteria which enter into the cell.
- They are also used to digest the food.

6 Vacuoles:

- These are single membrane bounded organelle.
- They are large in plant cell and present in the centre of cell, while small in animal cell and are distributed in the cell.
- They are store houses of water and other metabolic products.
- They give support and help in rigidity to plant cell.

Note

7 Mitochondria:



MCQs

- They are known as power house of the cell.
- Their number is different in different cells, depending upon the nature of the cell.
- They have two membranes; outer and inner membrane.
- Inner membrane forms finger like folding called Cristae.
- Inside the mitochondria there is present liquid material called Matrix.
- They have their own DNA.
- They are self replicating bodies.
- They synthesize ATP (Adenosine tri phosphate) which is used to provide energy in cell.

currency of energy

8 Plastids:

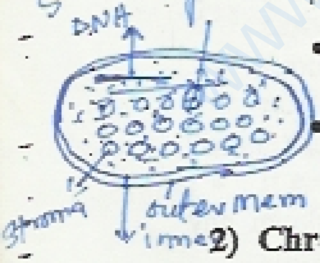
- They are only present in plant cell.
  They are of three types.

✓ 1) Chloroplasts:

short note.

collectively grana

- They are present in green parts of the plants like leafs.
- They consist of three parts, outer double membrane, stroma and grana.
- Stroma is a liquid part which surrounds the grana, it also contains proteins, DNA and carbohydrates.
- Grana, consists of thylakoids which in turns contain a green pigment called Chlorophyll which helps in photosynthesis.
- Chlorophyll is similar to haemoglobin except it contains Mg (magnesium) ion instead of Fe (iron) ion.



Chlorophyll ⇒ magnesium
Haemoglobin contains Iron.

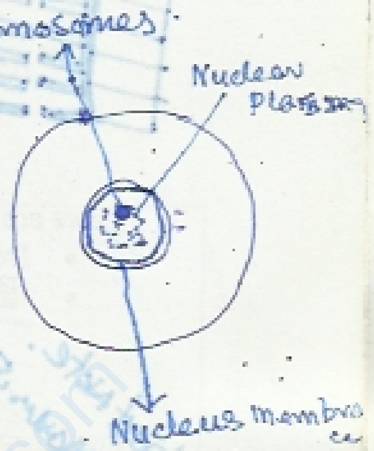
2) Chromoplasts:

Thylakoids

- They are present in the petals of flowers.
- They imparts different colors to plants other than green
- They help to produce attraction in flowers.

√3) Leucoplasts:

- They are present in underground parts of the plant. such as roots.
- They are colorless.
- They help to store food. + Minerals + water



9) Centriole:

- They are only present in animal cell.
- They are present near the nucleus.
- Each centriole consists of nine microtubules, arranged in a circle.
- Each of microtubule is further consists of three tubules.
- They help in cell division by formation of spindle fibers.

10) Nucleus:

short note

- In animal cell it is present in the centre of cell while in plant cell it is present near the cell membrane.
- It consists of two parts.

1) Nuclear Membrane:

- It is composed of two membranes; outer and inner membranes.
- There are nuclear pores present in nuclear membrane, through which exchange of material take place between cytoplasm and nucleoplasm.
- Number of nuclear pores is variable.
- Nuclear membrane separates the nucleoplasm from the cytoplasm.

2) Nucleoplasm:

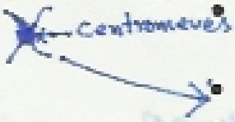
It is the liquid material present inside the nuclear membrane. It consists of two most important components.

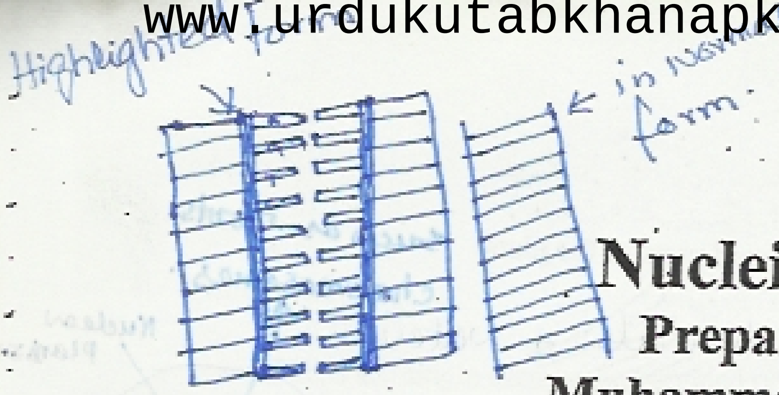
a) Nucleolus:

- It is not surrounded by any membrane.
- Their number also varies.
- They consist of RNA and rDNA.
- Function They are used to synthesize ribosomal RNA.

b) Chromosomes:

- They are thread like structures
- Their number is different in different animals. Human has 46, frog 26 etc.
- They are only visible during cell division.
- Chromosomes have arms and centromeres (Spindle fibers are attached to centromeres during cell division).
- Chromosomes are composed of proteins and DNA.
- DNA is the hereditary material (which transfers from parents to offspring).





Nucleic Acid
Prepared by
Muhammad Atif Ali

N.B
Types of RNA
Three Types

N.B
Differentiate
B/w DNA and RNA

There are two types of nucleic acids.

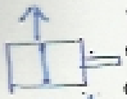
- Deoxy ribo nucleic acid (DNA).
- Ribo nucleic acid (RNA).

Short note: Marks 5

De-oxy-ribo Nucleic Acid
(DNA)

- It was discovered by a German scientist Friedrich Miescher in 1869.
- DNA is present in chromosomes.
- It is the hereditary material, which transfer prom parents to offspring.
- It is a double helical structure (it has two strands). It is just like ladder.
- DNA is a polymer of many monomers (Nucleotides).
- So, each strand is composed of large number of nucleotides.
- Each nucleotide is composed of a nitrogenous base, glucose group and phosphate group.
- There are four types of nitrogenous bases, Adenine, Guanine, Cytosine and Thymine. These are also called codes
- Each nucleotide has one of above mention nitrogenous base.
- Adenine of one strand always forms bond with the Thymine and Guanine forms bond with Cytosine of opposite strand.
- MCQ's Adenine and Guanine are called Purine.
- MCQ's Cytosine and Thymine are called Pyrimidines.

This is sub-unit



is called Nucleotide

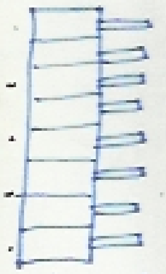
Three Rings

Ribo Nucleic Acid
(RNA)

Short note

- It is a single strand structure. its sub-units are called Nucleotides.
- It has ribose sugar instead of deoxy ribose sugar.
- It has nitrogenous bases, but instead of Thymine it has Uracil.
- It is not hereditary material.
- It is of three types, messenger RNA (mRNA), ribosomal RNA (rRNA) and transfer RNA (tRNA).
- mRNA carries the message from DNA. is called transcription
- rRNA is present in ribosomes.
- tRNA transfers the amino acids from cytoplasm to ribosome for the synthesis of protein. Making of

Formation of Protiens from ~~tRNA~~ mRNA is called Translation



RNA single strand structure:

Gene is part of chromosomes which control a particular Character

Formation of mRNA from the DNA is known as Transcription.

Differentiate between Transcription and Translation

- Synthesis of mRNA from DNA is called **Transcription.**
- Synthesis of protein from mRNA is called **Translation.**

"Difference between Plant and Animal cell"

Plant cell	Animal cell
1. Plant cell has cell wall.	1. It has no cell wall.
2. It has plastids	2. It has no plastids.
3. It has large vacuole present in the centre of the cell	3. It has small vacuoles, which are distributed through out the cell.
4. It has no centriole.	4. It has a pair of centrioles, present near the nucleus.
5. Nucleus is not present in the centre of the cell	5. Nucleus is present in the centre of the cell.

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Most Important

CSS-2010

GLANDS

Prepared by
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Definition:

Gland is a group of cells which secrete special chemicals called hormones or enzymes.

Hormones:

Hormones are organic compounds which are secreted by glands. Chemically hormones are of two types, they are either protein in nature or lipids in nature (steroids).

Enzymes:

Enzymes are only composed of proteins.

Glands are of two types, endocrine glands and exocrine glands.

Endocrine Glands

is known ductless gland

These are those glands which pour their secretions (hormones) into the blood to reach their target cells or areas. They are also known as ductless glands. For example, pituitary gland, thyroid gland etc.

Exocrine Glands

is known duct glands.

These are those glands which pour their secretions (enzymes) into a duct which transfers those secretions to target cells or areas. They don't pour their secretions directly into the blood. They are either present within those target areas or use ducts to transfer their secretions. They are also known as duct glands. For example, sweat gland, salivary glands etc.

duct ↓

Seven Types of Endocrine Glands

(1) **Hypothalamus:**

Two chemicals (1) (2)

It is a part of forebrain. It secretes oxytocin and antidiuretic hormone (ADH), (Abbr) which are stored in the posterior part of pituitary gland. This hypothalamus controls all the endocrine glands.

Master gland due to it controls other glands of body.

Trachea
Esophagus
95K

(2) Pituitary Gland

It is also known as master gland of the body, its weight is about 0.5 gm and its size is equal to the size of the seed of pea. It has three lobes (Parts), anterior (1), median (2) and posterior lobe (3).

بیج

Anterior lobe: /Part

It secretes following hormones:

- (1) **Somatotrophin hormone (STH):**

  It is also known as growth hormone. It controls the growth of the body. It is secreted trough out the life. If it is secreted in excess amount in early life then it causes a disease called Gigantism (abnormal developments of hands, feet, jaws etc). If it is secreted in less amount then it causes Dwarfism (stoppage of the growth of different parts of the body).

  gigantism

- (2) **Thyroid stimulating hormone (TSH):**

  This hormone stimulates the thyroid gland to secrete its secretion "Thyroxin", when its amount decreases in the blood. It is also secreted throughout life but its secretion is very high in early stages of life.

- (3) **Adrenocorticotrophic hormone (ACTH):**

  This hormone stimulates the adrenal gland to secrete its secretion "Adrenalin" when its secretion is needed in the body during stress. It is also secreted throughout life but during the stress conditions.

- (4) **Gonadotrophic hormone (GH):**

  There are three types of Gonadotrophic hormones, Follicle Stimulating Hormone (FSH), Luteinising Hormone (LH) and Prolectin Hormone.

Function:
(1) growth of follicle
(2) estrogen from ovaries

1) **FSH:** In females (1) it stimulates the development (growth) of follicles and secretion of estrogen hormone from the ovaries. (2) In males it stimulates the production of sperms in testis.

2) **LH:** In females (1) it stimulates the rupture of mature follicle to release egg. It also maintains the Corpus luteum and the secretion of progesterone (pregnancy

کارپس لتیم

hormone). In males it stimulates the testis to secrete a hormone called testosterone.

3) Prolactin: In females it stimulates the production of milk while in males it is not secreted.

Median lobe:

It secretes only one hormone called Melanophore stimulating hormone.

- **Melanophore stimulating hormone (MSH):**

It stimulates the melanocytes in skin to produce a brown pigment melanin, which gives color to skin. Excess secretion of this hormone causes the darkening of skin.

Posterior lobe:

it is store house for hormones

This lobe does not secrete its own hormones. It only acts as store house for the hormones which are secreted by hypothalamus, Antidiuretic hormone and Oxytocin.

ADH.

- **Antidiuretic hormone:**

Function: To maintain a percentage of water in blood

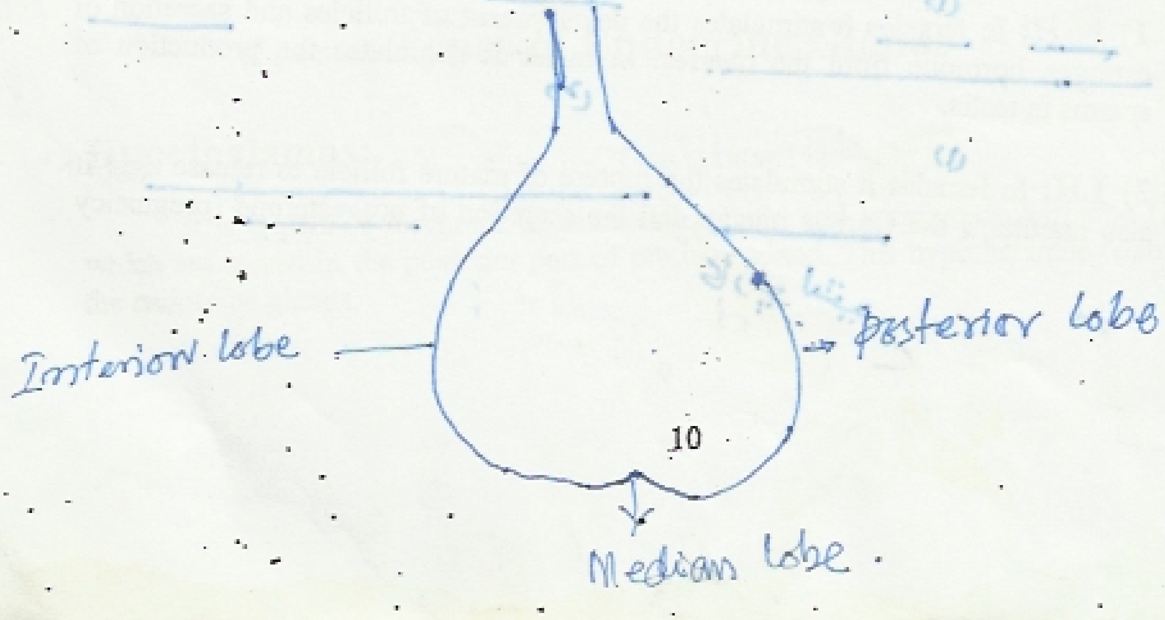
This hormone is secreted when the level of water decreases in blood. It acts on kidneys and compel them to absorb maximum amount of water from urine. A lack of this hormone causes a disease called Diabetes insipidus, in which excess amount of water is released through urine and person feels a great thirst.

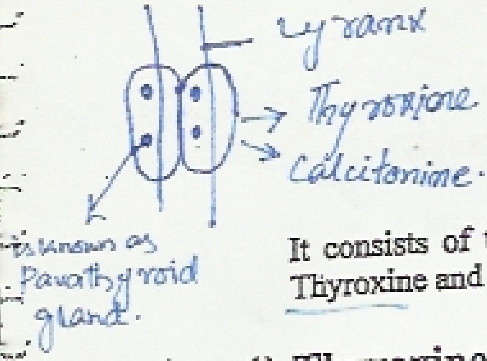
Diabetes Insipidus

- **Oxytocin:**

Function

It is also secreted in females. It causes the contraction and expansion of the muscles of uterus during child birth. It also causes the ejection of milk from the mammary glands.




Lyranx
Thyroxine
Calcitonine
is known as Parathyroid gland.

(3) Thyroid gland

It consists of two lobes, situated below the larynx. It produces two hormones Thyroxine and Calcitonine.

1) Thyroxine:

Thyroxine

Function

- It increases the metabolic rate of glucose. in body
- Thyroxin also involve in the growth of body along with Somatotrophin hormone.
- It helps in the differentiation of brain cells (which cells have to perform which functions).
- Excess secretion of thyroxin causes a disease called "**Graves**" in which metabolic rate increases very high which can lead to the failure of heart if it persists for a longer period of time.
- Deficiency of thyroxin causes two diseases, Cretinism and Goiter.
- In **Cretinism** individuals fail to develop normally and may be mentally retard.
- **Goiter** is mainly due to the deficiency of iodine which is an important component of thyroxin. In goiter fats deposited around the neck and amount of fat also increase in hands and skin.

Graves
Goiter
Cretinism

2) Calcitonine:

Reverse

- It lowers down the concentration of calcium ion in the blood. and keep it in bones.

(4) Parathyroid Gland

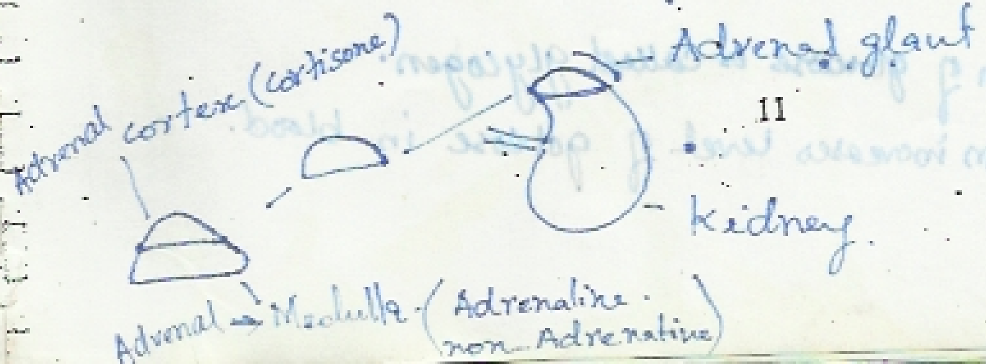
- These glands are present on the thyroid gland.
- These are four in numbers.
- Their secretion is called Parathyroxin or Parathormone.

Parathormone:

- It increases the concentration of calcium ions in the blood.

(5) Adrenal Gland

- They are present on the top of each kidney.
- Each adrenal gland consists of two parts, adrenal cortex and adrenal medulla.


Adrenal gland
Kidney
Adrenal cortex (cortisone)
Adrenal → Medulla (Adrenaline . non-Adrenaline)

a) Adrenal cortex:

- It secretes a hormone called cortisol.

Cortisol: convert protein into glucose.

- It increases blood glucose level mainly from the metabolism of protein.

b) Adrenal medulla:

- It secretes two hormones, adrenaline and nor-adrenaline. Both these hormones are secreted in stress conditions. They have similar as well as different functions.

Differentiate

1) Adrenaline:

opens

- During stress conditions it dilates the blood vessels, which are going to skeletal muscles (it increases the flow of blood to muscles).
- It increases the heart beat and blood pressure.
- It increases the release of glucose from liver where it is stored in the form of Glycogen.

2) Nor-adrenaline:

close

- During stress conditions it constricts the blood vessels, which are going to digestive system (it decreases the flow of blood to digestive system).
- It also increases the heart beat and blood pressure.
- It also increases the release of glucose from liver, where it is stored in the form of Glycogen.

(6) Pancreas

(1) (2)

It is the only gland in the body which acts as both exocrine and endocrine at the same time. Here we will see only its endocrine functions. It secretes two hormones, insulin and glucagon.

1) Insulin: لبلبہ

- It decreases the level of sugar in the blood and converts it into glycogen which is stored in the liver.
- If it is not secreted in the body then a disease is caused called **Diabetes mellitus**.

⇒ Store form of glucose is called glycogen.

⇒ Glucagon increases level of glucose in blood.

Differentiate = Glycogen-

2) Glucagon:

- It increases the level of sugar in the blood by breaking glycogen.

(7) Gonads

Gonads include ovaries in females and testes in males.

A) Ovaries:

There are two ovaries present in females. These secrete two hormones, Oestrogen and Progesterone.

1) Oestrogen:

MCQs

- It is secreted by follicles
- It causes the development of secondary sexual characters, like growth of hairs on the body, development of mammary glands etc.
- It causes thickening of uterine walls.
- It helps in healing and repairing of uterine walls after menstrual cycle.
- Deficiency of this hormone causes the failure of individual to mature sexually.

2) Progesterone:

MCQs

- It is produced by Corpus luteum.
- It stops further ovulation (egg lying).
- It prepares the uterus to perceive pregnancy.
- It is also known as pregnancy hormone.

B) Testes:

Two testes are present in males. Each testes secretes a hormone called testosterone.

Testosterone:

- It causes the development of secondary sexual characters, like growth of hairs on the body, change of voice etc.

Digestive System

Prepared by

Muhammad Atif Ali

The system in which breakdown of larger food particles to smaller absorbable food particles take place is called digestive system.

It consists of following parts:

- ① ✓ Oral cavity
- ② ✓ Esophagus → ایسوفیگس
- ③ ✓ Stomach
- ④ ✓ Small intestine
- ⑤ ✓ Pancreas
- ⑥ ✓ Liver
- ⑦ ✓ Large Intestine

Oral Cavity
(Mouth)

In oral cavity three structures are present, Teeth, tongue, and salivary glands.

- Teeth help in grinding the food.
- Tongue help in mixing the food with the saliva of salivary glands.
- There are three pairs of salivary glands in the mouth. Their secretion is called Saliva.
- MCQs Saliva contains water, Sodium bi carbonate and Amylase enzyme. PH of saliva is 8 when it is secreted but suddenly decreases from 8 to 6 after releasing carbon di oxide. MCQs

Water:

- moistens and lubricates the food

Sodium bi Carbonate:

- It act as an Antiseptic
- It also helps to stabilize the PH of food.

Saliva is combination of water sodium, bicarbonate and Amylase enzyme.

Amylase enzyme:

Amylase: امائیلس

MCQs – It acts on starch and glycogen and converts them into maltose.

carbohydrate → Fat

second form of glucose.

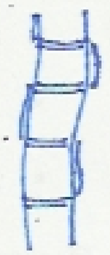
- When food leaves the oral cavity then it is in the form of a small ball like structure called bolus. This bolus then enters into the next part of digestive system called esophagus. bolus

Esophagus

Tube like Structure :⇒ ایسوفیگس

- It is like a pipe which starts from the oral cavity and ends at the stomach.
- Its walls are composed of two types of muscles circular and longitudinal muscles.
- Both these muscles help in the movement of the bolus from the esophagus.
- The movement of food from the esophagus and the whole digestive system is called **peristalsis movement.**
- During peristalsis movement muscles squeezes just behind the bolus and push it forward, this process continues until food enters into stomach.
- If opposite movement (anti peristalsis) started the vomiting takes place.

Peristalsis



Stomach

- It is a muscular bag like structure.
- At its upper end there is present a valve called Cardiac sphincter
- At its lower end there is present another valve called Pyloric sphincter.
- In between two sphincters the remaining part of stomach is called Body.
- Stomach wall is composed of three layers, outer middle and inner layer.
- Inner layer is also known as mucosa.
- It contains gastric glands which are composed of three different types of cells, mucous, parietal and zymogen cells.

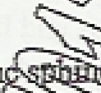
Inner lyer

1. Mucous cells:

- These secrete mucous which forms a layer of mucous over the inner layer of stomach which protects the stomach from the stomach wall from digestion.\

2. Parietal cells:

- These secrete HCL (Hydrochloric Acid).
- It kills the microorganisms in the food.
- It changes the PH of food.
- It converts the Pepsinogen into pepsin.



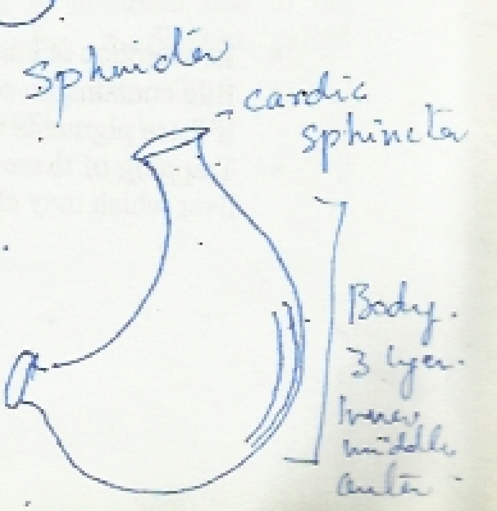
3. Zymogen cells:

Pepsinoge

1.5 Litre.

Stomach

↓ 3.5 Litre.



Pepsi —— Protein - polypeptides or peptone
Trypsin —— Protein - polypeptide
Amylase —— Starch - maltose
Lipase —— Fat - Fatty acids
Sodium bicarbonate - Antiseptic - pH maintain

- These secrete the Pepsinogen which after its conversion into pepsin, changes the proteins into peptones and polypeptides.

Before the food leaves stomach it changes into semi-fluid like structure called chyme, which enters into small intestine. قائم

Small intestine

- Small intestine is six meter long.
- It is further divided into three parts, Duodenum, Jejunum and Ileum.

1) Duodenum: — Enterokinase

- It is the first part of small intestine.
- It is 20 to 25 cm long.
- When food enters into duodenum it causes the release of secretions from pancreas and liver.
- Both pancreas and liver pour their secretions directly into duodenum.

Pancreas:

- Its secretion is known as pancreatic juice, which enters into the duodenum through pancreatic duct.
- It contains three enzymes and Sodium bicarbonate.
  1. **Amylase:** It digests starch into maltose.
  2. **Lipase:** it digests fats into fatty acids and glycerol.
  3. **Trypsinogen:** It is an inactive form and is converted into active form called Trypsin with the help of enterokinase, which is secreted by duodenum. Trypsin digests proteins into polypeptides ٹرپسینوجن

Sodium bicarbonate:

- It neutralizes the acidic chyme.

Liver:

- Its secretion is known as bile, which enters into the duodenum through bile duct.
- Bile contains no enzymes, but it contains bile pigments which give it green color. If these pigments trap into the liver then Jaundice may result.
- Trapping of these pigments may be due to the accumulation of cholesterol in the liver which may change into gall stone.

- Bile pigments are formed from the breakdown of haemoglobin in the liver.
- Bile also contains bile salts which help in the breakdown of fats.

Duodenum itself only secretes one enzyme called enterokinase which helps in the activation of Trypsinogen into Trypsin.

Pepsin-trysin — Protein
Poly-peptides
Amino-peptide 00000
Erypsin-00
Dipeptide-
Amino acid-

2) Jejunum:

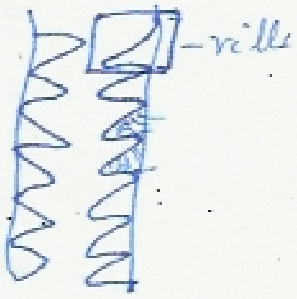
- It is the second part of small intestine.
- It is 2.4 meter long
- Food is completely digested in jejunum.
- Secretions of jejunum are collectively known as intestinal juice.
- It contains five enzymes.

1. **Amino peptidase:** It converts polypeptides into dipeptides.
2. **Erypsin:** It converts dipeptides into amino acids.
3. **Lipase:** It converts fats into fatty acids and glycerol.
4. **Maltase:** It converts maltose into glucose.
5. **Lactase:** It converts lactose into glucose.

Amailase - Starch - Maltose

3) Ileum:

- It is the third part of small intestine.
- Absorption of food takes place in ileum.
- Internal surface of ileum has finger like projections called Villi.
- Each villus (singular) is richly supplied with blood vessels, which absorb the food from ileum.
- Undigested food is not absorbed in ileum and is pushed forward into large intestine.



Large intestine

- It consists of three parts; caecum, colon and rectum.

1) Caecum:

- It is a blind sac that is present between ileum and colon.
- From caecum there arises a finger like projection called Appendix.
- Appendix has no function in human. Some times it is inflamed due to the entrapping of undigested food particles and causing a disease called Appendicitis.
- Some amount of water and salts are absorbed in the caecum.

2) Colon:

- In colon the remaining salts and water is absorbed here.
- Some useful bacteria are also present in colon which helps in the synthesis of vitamin K.
- If salts and water is not absorbed in the colon, then a disease called **Diarrhea** occurs.
- If salts and water is absorbed excessively then a disease called **Constipation** occurs.
- Undigested material in the form of feces enters into the rectum.

3) Rectum:

- It is the last part of large intestine.
- It is a sac like structure.
- Feces are temporarily stored in rectum.
- From rectum feces are excreted outside through anus.

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0323-5045013

Circulatory System

Prepared by
Muhammad Atif Ali

Definition:

The system in which gases are circulated through out the body is called circulatory system.

It consists of three parts, Blood, blood vessels and Heart.

Blood

Blood is a highly complex material consists of plasma and blood cells.

Composition of blood:

Blood is composed of 55% Plasma and 45% Blood cells.

Plasma:

- Plasma consists of 90% water, 8% solids and 2% gases (Oxygen, Nitrogen and Carbon di oxide).
- Solids are of two types, inorganic and organic.
- Inorganic are Na, K, Ca, and Mg.
- Organic includes, Plasma proteins like Albumin, Globulin, Fibrinogen etc.
- Non-protein nitrogenous substances like urea, uric acid etc.
- Fats like phospholipids, cholesterol etc.
- Carbohydrates like glucose etc.
- Coloring matters like Bilirubin, Carotenes etc.

Blood Cells:

- These form 45% of the blood volume.
- There are three types of blood cells, RBC, WBC and Platelets.

RBCs (Erythrocytes):

- They are biconcave in shape.
- Their size is 7.2 micro-meter.
- Their number is 7-8 million per milli meter cube.
- They have no nucleus.

- They contain haemoglobin, which help in the transport of gases e.g CO_2 and O_2.
- Their average life span is 120 days.

WBCs (Leucocytes):

Colourless Substance

- They are round in shape.
- Their size is greater than RBCs.
- Their number is 4-11000 per milli meter cube.
- They have nucleus.
- Their function is to defend the body from any harmful foreign particle which enters into the body.
- They are colorless.
- Their life span ranges from months to years.

Platelets:

- They are oval in shape.
- Their size is 2-4 micro-meters.
- Their number is 3-4 million per milli meter cube.
- They also have no nucleus.
- Their function is in blood clotting.
- They are colorless.
- Their life span ranges from months to years.

Blood Vessels

There are three types of blood vessels: Arteries, Veins and Capillaries.

Arteries:

- These carry oxygenated blood except pulmonary arteries.
- These carry blood from heart and distribute it to other parts of body.
- Blood pressure in arteries is more as compared to other blood vessels.
- The wall of arteries is made up of three layers, outer, middle and inner layer.
- Middle layer is highly muscular to withstand higher blood pressure.
- They have no valves.
- Shape of the lumen is round in arteries.

Veins:

- These carry deoxygenated blood except pulmonary veins.
- These carry blood from body to heart.

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- Blood pressure in veins is low as compared to arteries.
- The wall of veins is also made up of three layers, outer, middle and inner layer.
- Middle layer is not highly muscular.
- They have valves.
- Shape of the lumen is oval in veins.

Capillaries:

- These carry both oxygenated and deoxygenated blood.
- Blood pressure in capillaries is least.
- The wall of capillaries is only one cell thick.
- They have no valves.
- Exchange of gases takes place in capillaries.
- Their walls are permeable to water and gases.

Human Heart

- It is a sac like pumping organ.
- It is enclosed in a double membrane sac called Pericardial cavity.
- Heart is composed of special muscles called cardiac muscles.

Structure:

- There are four chambers of human heart.
- Two upper chambers, right and left are called atria which are thin walled.
- Two lower chambers, right and left are called ventricles which are thick walled.
- Right atrium and right ventricle are completely separated from left atrium and ventricle.
- Valves are present at the junction of atria and ventricles.

Circulation of blood in the heart:

- All the deoxygenated blood is collected from the body through veins.
- All the veins from body open into a large vein called vena cava (Superior and inferior vena cava).
- Vena cava pours its deoxygenated blood into right atrium of heart.
- Then right atrium contracts and blood enters into right ventricle through valve.
- From right ventricle there arises a pulmonary trunk which bifurcates into right and left pulmonary arteries which in turn enter into right and left lungs.
- Then right ventricle contracts and blood through pulmonary arteries enters into lungs.
- In the lungs oxygenation of blood takes place.
- From each lung there arise pulmonary veins which enter into left atrium.

- After oxygenation blood enters into the left atrium through pulmonary veins.
- Then left atrium contracts and oxygenated blood enters into the left ventricle trough a valve.
- From left ventricle there arises a main artery called aorta.
- When left ventricle contracts blood enters into the aorta, from where oxygenated blood is distributed into the whole body.

Diastole:

The relaxation of heart chambers is called diastole.

Systole:

Contraction of heart cambers is called systole.

- One complete heart beat consists of one diastole and one systole, and lasts for about 0.8 seconds.
- Heart contracts 72 times in one minute.

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Passage of air through the respiratory tract during inspiration is; Nostril - Nasal cavity - Pharynx - Larynx - Trachea - Bronchi, Bronchioles - Alveoli

Excretory System

Prepared by
Muhammad Atif Ali

Definition:

"The system, in which metabolic waste products are excreted out of the body".

- A pair of kidney is present in the body for the excretion of metabolic waste products.
- Right kidney is slightly lower than the left kidney. MCQs
- Kidneys are two in number.
- They are attached to the dorsal body wall, on either side of the vertebral column.

Structure of Kidney

- Each kidney is bean shaped.
- Its weight is less than 1% of the total weight of the body.
- 20% of the blood during each heart beat is supplied to each kidney.
- In each kidney there is a lighter outer region which is called Cortex.
- The inner pale region is known as Medulla.
- There are cone shaped structures present in Medulla which are known as Pyramids.
- There is a funnel like space into which pyramids project, called Pelvis.
- Ureter - a duct- emerges from this space (Pelvis).
- Ureter from each kidney enters into a sac like structure called Urinary bladder. Urinary bladder opens to the outside through urethra.
- Each kidney is composed of about 2- million tiny tubes called nephron.

Structure of Nephron

- Nephron is the structural and functional unit of kidney.
- Nephrons are arranged along the both cortex and medulla regions.
- There is a cup shape structure present at proximal end of the each nephron called Bowman's capsule.
- From Bowman's capsule there arises a long narrow tube, which is further divided into three parts.
- First convoluted part is known as Proximal tubule.
- Long U shape part is known as Loop of Henle.
- Second convoluted part is known as Distal tubule.
- Distal tubule opens into a duct called Collecting duct.
- Afferent artery enters into the Bowman's capsule and divide repeatedly to form a ball like structure Glomerulus.

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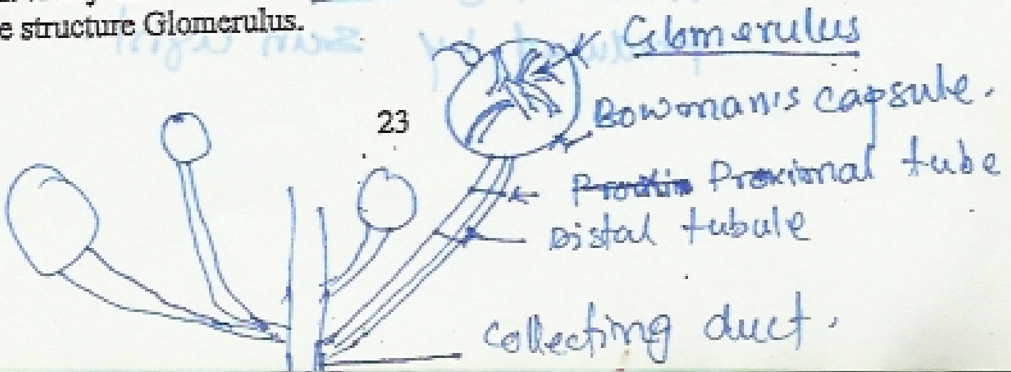


- Walls of the Glomerulus are porous.
- From Glomerulus there arises Efferent arteriole which forms a network of capillaries around the proximal, loop of Henle and distal tubule, that network is called Peritubular capillaries.

Working of Nephron:

1) Filtration:

- Blood containing waste products enters into Glomerulus.
- Due to high blood pressure and porous walls of the Glomerulus blood is filtered here.
- Blood cells and proteins remain in the Glomerulus while glucose, urea uric acid and some important salts are filtered here.
- That filtrate enters into the proximal part of the nephron.

2) Reabsorption:

- All the useful constituents of the filtrate like glucose, salts and water is reabsorbed in the proximal, loop of Henle and distal part of the nephron by the Peritubular capillaries which are surrounding these parts.

3) Secretion:

- The inner layer of the nephron also secretes nitrogenous waste products into the lumen of nephron.

All the waste products from the distal part enter into the collecting duct which interns opens into the pelvis. From pelvis these enters into the Ureter then store into the urinary bladder from there excreted outside through urethra.

Other Functions of Kidney

- ✓ Regulation of blood volume
- ✓ Regulation of blood pressure
- ✓ Regulation of ion balance salts.
- ✓ Regulation of acid-base balance
- ✓ Synthesis of vitamin D

vitamin D is Sun Shine vitamin & Produced by Sun Light.

many mcqs

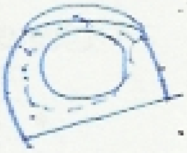
Soma
Axon
Roots

Central Nervous System

Prepared by
Muhammad Atif Ali

Neuron:

"The structural and functional unit of nervous system is called neuron".



Central nervous system consists of Brain and Spinal cord.

Brain

Skull includes facial bones

Cranium
Meninges
Brain
cerebro spinal

- Brain is protected by a hard bone called Cranium, a layer called meninges and cerebrospinal fluid.
- Brain is divided into three parts, Forebrain, Midbrain and Hindbrain.

Forebrain

- It is further divided into three parts, the thalamus, the limbic system, and the cerebrum.

The Thalamus:

- It transfers sensory informations to the limbic system.
- Sensory informations includes auditory and visual informations. and skin informations
- It also transfers informations from skin to the limbic system.

Limbic System: → also divided into three parts.

- It is further divided into three parts, hypothalamus (1), the amygdala (2) and hippocampus. (3)

Hypothalamus:

- It controls body temperature, hunger, menstrual cycle, water balance and the sleep-wake cycle.

Amygdala:

- It produces sensation of pleasure, punishment, sexual arousal and feelings of fear and rage.

Hippocampus:

- It controls long term memory and is required for learning.

Cerebrum:

- It is the largest part of brain.
- It is divided into two halves, called hemispheres which are connected with each others through a band of neurons called **Corpus callosum**.
- Left hemisphere controls right side of the body, while right hemisphere controls left side of the body.
- Outer region of cerebrum is called cerebral cortex.
- It receives sensory information, processes them and stores them in memory for future use.
- It controls voluntary movements, and is responsible for thinking.
- It is also involved in intelligence, reasoning and judgment.

Cerebrum
Corpus callosum

Midbrain

- It connects forebrain with the hindbrain.
- It contains reticular formation, which is important in screening the input information.
- It contains relay centre for auditory information.
- It controls reflex movements of eye.

Hindbrain

- It consists of three parts, medulla, pons and cerebellum.

Medulla:

- It controls breathing, heart rate, blood pressure and swallowing.

Pons:

- It controls transitions between sleep and wakefulness.

Cerebellum:

- It is important in coordinating movements and maintaining position of the body.
- It is also involved in learning and memory storage.

Skeleton of Human

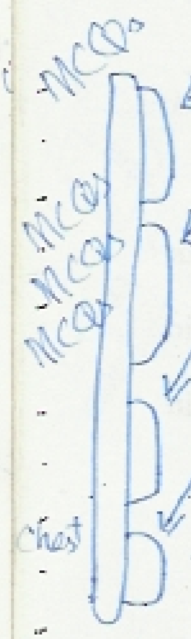
Prepared by
Muhammad Atif Ali

There are 360 bones in children while in adults these reduce to 206 bones.

Vertebral column:

It consists of 33 vertebrae. one backbone kind

There are four kinds of vertebrae which are named after their location in the body.



- **Cervical Vertebrae:** It includes 7 vertebrae, which lie in the neck region.
- **Thoracic Vertebrae:** There are 12 thoracic vertebrae, which are located in the thoracic region.
- **Lumbar Vertebrae:** There are 5 lumbar vertebrae, which are located in the lumber region.
- **Pelvic Vertebrae:** There are 9 pelvic vertebrae, which are located in the pelvic region.

Rib Cage:

MCQs → MCQs

There are 12 pairs of ribs, which are attached posterior with the thoracic vertebrae and 10 pairs out of them attached interiorly with the sternum. The 2 lower pairs are called floating ribs, because they are not attached with the sternum.

Bacterial Diseases

Disease	Name of Bacterium
Tuberculosis	*Mycobacterium tubercle bacilli*
Leprosy	Mycobacterium leprae
Tetanus	*Clostridium tetani*
Meningitis	*Meningococci*
Diphtheria	*Cornybacterium diphtheria*
Cholera	*Vibrio cholerae*
Dysentery	*Salmonella shigella*
Typhoid	*Salmonella typhi*

Short Note:

Vaccines

Prepared by
Muhammad Atif Ali

Definition:

"The administrations of killed or attenuated live (half killed) micro-organisms (bacterial or virus) into the body to protect it against the specific disease by stimulating the formation of antibodies".

Characteristics of Vaccines:

1. Vaccines are given orally or intramuscularly.
2. Vaccines are safe and reliable but not perfect.
3. It provides immunity within two weeks after administered in the body.
4. A single dose of some vaccines provide a life-long protection against infection.

Types of Vaccines:

There are two main types of vaccines:

Killed Vaccines:

- These are those vaccines which contain killed micro-organisms, but those micro-organisms retained the property of antigenicity.
- These vaccines can be used safely for immunization.
- For example, Cholera, Rabies vaccines etc.

Half killed

Live Vaccines:

- These are those vaccines which contain live micro-organisms.
- These micro-organisms retain their antigenicity, but are made avirulent by specific treatment.
- These microorganisms are basically half killed or attenuated, which have the ability to produce immunity but are unable to cause disease.
- For example: Polio, TB, Yellow fever vaccines etc.

(1) Antigen: Micro-organism or antibodies are procuded one called antigen.

(2) Antibodies one produced by white boold sells. against foreign particles / micro organism.

5 mark notes.

Enzymes

Prepared by

Muhammad Atif Ali

Definition:

"Enzymes are biological catalyst which are used to increase the pace of a biochemical reaction and are specific for each reaction".

Structure of enzymes:

Definitions & 1 marks

Important Topic

- Enzymes are protein in nature.
- But some have a non-protein part called co-factor.
- Mcq Co-factor is essential for the functioning of particular enzyme.
- Co-factors are, like Magnesium, Iron, Copper, Zinc ions etc.
- Mcq If the co-factor is detachable then is called activator. → Temporary attache
- Mcq If the co-factor is not detachable then is called prosthetic group. Permanently a
- Mcq If cofactor is loosely attached to the protein part then it is called co-enzyme.
- Mcq Enzyme without cofactor is called apoenzyme.
- Mcq Enzyme with its cofactor is called holoenzyme.
- Mcq The substance (material) on which enzyme acts is called substrate.

Mechanism of enzyme action:

Enzyme + Substrate → Enzyme substrate complex → Enzyme + Product

Characteristics of Enzymes:

- All enzymes are protein in nature.
- They increase the rate of reaction without being used.
- Their presence does not affect the nature of end product.
- Small amount of enzyme can bring change in a large amount of the substrate.
- They are specific for specific chemical reaction.
- They lower the activation energy of reaction.
- Some enzymes require a co-factor for their proper functioning.
- They are sensitive to even a minor change in PH, temperature and substrate concentration.

Immunity

Prepared by
Muhammad Atif Ali

5 Marks Note

CSS-2010

Definition:

ability

"The capacity to recognize the intrusion of any material, foreign to the body and to specific cells and cell products to help to remove the particular sort of foreign material with greater speed and effectiveness is called immunity".

- Mainly white blood cells form the immune system of the body.
- They secrete special chemicals which are protein in nature and are called **antibodies.**
- Any foreign substance, which stimulate the formation of antibodies in the body is called **antigen.**

Types of immunity:

There are two main types of immunity, Active immunity and Passive immunity.

1) Active immunity:

The use of vaccines to stimulate the production of antibodies in the body and making the body immune against the disease is called active immunity.

There are two types of active immunity.

acquired

a) Artificially induced active immunity:

The active immunity which is achieved by artificially introduction of antigen in the body is called artificially induced active immunity.

acquired

b) Naturally induced active immunity:

When a person is exposed to an infection becomes ill and survives, then this immunity develop against that disease is called naturally induced active immunity.

2) Passive immunity:

acquired

The immunity which is achieved by introduction of antibodies directly into the body is called Passive immunity.

[illegible] organic compounds which are essential for the growth of the body. There are two main types of vitamins:

Note: 5 marks

Vitamins

CSS-2010

Prepared by
Muhammad Atif Ali

N.B

Definition:

"These are organic compounds which are essential for the growth of the body. There are two main types of vitamins".
Fat soluble vitamins and water soluble vitamins.

Fat soluble vitamins:

These are those vitamins which can only be soluble in fats. These vitamins can be stored in the body especially in liver. For example Vitamin A, D, E and K.

Water soluble vitamins:

These are those vitamins which can only dissolve in water. These vitamins cannot be stored in the body. For example Vitamin B and C.

Fat soluble vitamins		
Vitamin	**Source**	**Deficiency (Disease)**
MCQ Vitamin A (Carotinoides)	Fish, liver, oils, egg yolk, carrot and green vegetables	Night blindness, dryness of skin
MCQ Vitamin D (Sun shine)	Butter, Milk, cheese, egg yolk and vegetable oils.	Rickets [illegible]
MCQ Vitamin E (Tochopherols)	Butter, meat, sunflower, cheese, egg yolk and vegetable oils.	Sterility - unable to Reproduce sexuality.
Vitamin K	Green leafy vegetables and cereals	Prolongation of blood clotting
Water soluble vitamins		
MCQ Vitamin C (Ascorbic Acid)	Citrus fruits, peas and tomatoes.	Scurvy / gum bleeding
Vitamin B Complex		
B1 (Thiamine)	Cereals, liver, heart and rice.	Beri beri

	kidneys.	
B2 (Riboflavin)	Milk, liver, heart and kidneys.	Dryness of tongue and skin
MCQ B3 (Niacin) نیا بسن	Egg yolk, milk, liver, heart and kidneys.	Pellagra (yellow skin)
B6 (Pyridoxine)	Wheat, corn oil and olive oil	Disorders in central nervous system and protein metabolism.
MCQs B12 (Cynocobalamine)	Liver, kidney, milk and cheese.	Anemia / Deficiency of red blood cells.

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MCQs

~~I destroy~~

I destory my enemies when I make them friends. (Abrahan Lincoln)

N.B Note 5 Marks.

Balance diet

Prepared by
Muhammad Atif Ali

Definition:

"A diet which contains all the essential nutrients of food in proper proportion is called balance diet".

The important nutrients which should be present in balance diet are Carbohydrate, fats, protein, water, vitamins and minerals.
Out of above mentioned nutrients first three are very important and are required in large quantity as compare to remaining ones.

⇒Percentage formula

MCQ	1. Carbohydrates	58%
MCQ	2. Fats	30%
MCQ	3. Proteins	12%

← Macronutrients.

Mineral → Micronutrients
vitamins
water

⇒ Quality formula

1. Carbohydrates	600 grams
2. Fats	100 grams
3. Proteins	37-62 grams

Minerals and vitamins are required in very minute quantity.

Separate note.
5 Marks.

⇒Carbohydrates

The word carbohydrates literally means "Hydrated carbons".
"They are composed of Carbon, hydrogen and oxygen"
Their general formula is $C_x(H_2O)_y$, where x and y denotes the number of carbon and water molecules.

Classification of carbohydrates / Three Types.

There are three main types of Carbohydrates, Monosaccharides, Oligosaccharides and polysaccharides

/ مونوسیچرائڈ

اولیگو سیچرائڈ

پولی سیچرائڈ

مونوسیچرائیٹ

Monosaccharides:

- These are simple sugars.
- They are sweet in taste.
- They are easily soluble in water.
- They cannot be further hydrolyzed.
- For example, glucose, ribose etc.

Oligosaccharides:

اولگوسیچرائیٹ

- They are less sweet in taste.
- They are less soluble in water.
- They can be hydrolyzed and on hydrolysis they produce two to ten Monosaccharides.
- When two monosaccharides are combined together, they form Disaccharides, when three monosaccharides are combined; they form trisaccharides and so on.
- For example, maltose, sucrose etc. → سیکروز. 3

سکروز

پولی سیچرائیٹ

Polysaccharides:

- They are most complex and most abundant.
- They can be hydrolyzed
- They are least soluble in water.
- For example, Starch, Glycogen, cellulose etc.

اسٹراچ ~~گلوکوجن~~ سیلولیس
گلوکوجن

Lipids / Fats

These are heterogeneous ("Hetero" means different and "geneous" means types) group of compounds related to fatty acids.
They are insoluble in water but soluble in organic solvents like ether, alcohol, chloroform etc.
These include fats, oils, waxes, cholesterol etc.

Separate Note:
5 Marks.

Protein

"These are polymer of many amino acids" / Protein is combination of amino acids-

Importance of Protein:

- They build many structures of the cell.
- All enzymes are protein in nature, so, they control the metabolism of cell.

- Some proteins act as carriers and transport specific substances like oxygen, ions etc.
- Some proteins are called antibodies, which are used to protect the body.
- Some are used to prevent the loss of blood from the body.

There are twenty different types of amino acids which form different types of proteins. These twenty types of amino acids can be divided into two groups, Essential and non-essential amino acids 10

10

A) Essential Amino Acids: 10 Types

- They are required by the body throughout the life
- They are taken by the body from outside. such as food
- Their deficiency causes different diseases.
- These amino acids includes Lysine, Argentine, Valine etc → ولین

B) Non-essential amino acids: → 10 Types

- They are not required throughout the life
- They are formed from the essential amino acids when they are required in the body.
- Their deficiency does not cause severe problems.
- These amino acids include Glutamine, Glysine, Serine etc.

گلائسین سیرین

Water

- The chemical formula of water is H2O
- Water is the medium of life.
- It is most abundant compounds in all organisms.
- In human there is about 20% water in bone cells, 85% water in brain cells and 70%/ 90% water in other body cells.
- Water is an excellent solvent.
- Enzyme can only work in aqueous environment.
- Water has great ability of absorbing heat.
- Water also forms a fluid cushion around organs to protect them from trauma.
- Daily up take of water for normal individual is 3-4 liters.
- our body is composed of 70% of water.

Water logging

Prepared by

Muhammad Atif Ali

Definition:

"The state of soil when water table raises to such an extent that surface becomes saturated 100 per cent with water and the soil becomes unfit for crop production".

Sources of Water logging:

1. Rain fall.
2. Seepage from canals and water courses.
3. Seepage from fields.
4. Floods.
5. Obstructions caused by canals.
6. Sub-soil rock formation.

Railway lines

Roads

Effects on plants:

- Water replaces air (oxygen) in the soil pores, leading to the deficiency of oxygen for the growth of plant.
- In water logged soil concentration of phosphorus, iron, manganese and silicon increases, which are toxic for plants growth.
- Production of toxic gases in the soil due to the activities of an-aerobic bacteria. by H_2S.
- Concentration of nitrogen, zinc and other important elements decreases, which are essential for plant growth.
- Growth of roots is restricted.
- Growth of stem is restricted.
- Leaf abscission (prepares to drop) and leaf chlorosis (pale coloring).
- Death of smaller roots.
- Absence of fruits.

Remedies:

- Seepage interceptor drains (along both sides of canals).
- Surface drains.
- Pumping of seepage water in the canals.
- Lining of canals.
- Pumping if ground water.
- Restricted practices of irrigations.
- Plantation along the banks of canals. Exp: Euclyptus
- Proper designing of canals (should run parallel to the rivers).
- Proper sewerage system.
- Baddings of canals

NAWAB OFFICERS ACADEMY

Soil erosion

Prepared by

Muhammad Atif Ali

Definition:

"Detachment and transfer of soil from one place to another by water and wind".

- 11.17 million hector area of Pakistan is affected by water erosion.
- 4.7 million hector area of Pakistan is affected by wind erosion.
- One billion tons of soil is lost from fields and silting up in dams annually.

Effects of erosion:

- Removal of surface soil.
- Effects on fertility.
- Effects on dams. = silting up of Dams
- Effects on floods.: decrease storage capacity of Rivers
- Spread of diseases. of soils. [illegible]
- Farms operations (expensive subsoil firming).

Types of soil erosion:

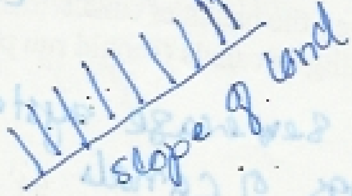
There are two main types of soil erosion, water and wind erosion.

A) Water erosion:

"The erosion caused by water is called water erosion".

Factors responsible for water erosion:

- The extent and distribution of rainfall.
- The slope of the land.
- The nature of the soil.
- Lack of vegetation on the soil.
- Method of ploughing.



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Remedies:

- By providing more vegetation on hilly areas.
- By making bunds.
- By leveling the soil and gullies.
- By ploughing the area across the slope of the soil.
- Avoid grazing of the animals on the sloppy land.
- Building of small dams to check the flow of water.
- Strip farming.

B) Wind erosion:

"Erosion caused by wind is called wind erosion".

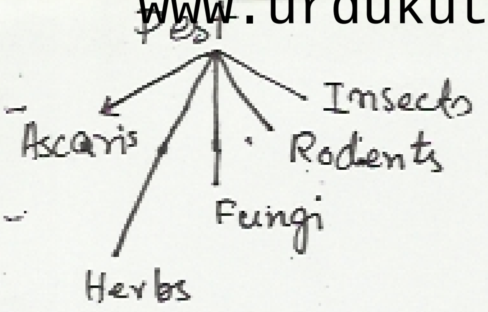
Factors affecting wind erosion:

- Aridity (less rainfall).
- Soil characteristics (moisture contents, mechanical stability, clods etc).
- Lack of vegetation on surface soil.
- Velocity of wind.

Remedies:

- Wind breaks. →implant
- Strip cropping.
- Mulching (remains of crops).
- Chemical measures (bitumen, petroleum products).
- Addition of organic matter in the soil.

www.urdukutabkhana.blogspot.com



Pesticides

Prepared by

Muhammad Atif Ali

2016

Pest:

"An insect, animal, fungi, weed etc are called pest when their number increases to such an extent that they start economic losses to human being".

Note

Pesticide: includes, insecticides, Rodenticide, Nematocide Fungicides and weedicides.

"Pesticide is any substance, organic or inorganic, which is used to destroy or inhibit the action of pests".

Classification:

On the basis of types of pests, pesticides are of following types.

Note

1) Insecticides:

Insecticides are those pesticides which are used to destroy the insects.

a) Insecticides of plant origin:

- نیکوٹین → Nicotine Sulphate.
- Pyrethrum.
- Rootenone.
- → Neem and Dharek.

b) Chlorinated hydrocarbons:

Abbri-

- DDT (Dichloro diphenyle trichloromethane). → banned
- BHC (Benzene hexachloride).
- Toxaphene.
- Aldrin. الدرین
- Endrine. انڈرائین

c) Organophosphorous insecticides:

- Ethyle parathion.

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- Methyle parathion.
- Malathion.
- Diozinin.

d) Caricides:

- Chlorobenzilate.
- Dicofol.

2) Rodenticide:

Those pesticides which are used to kill rodents like rats, mouse etc.
For example:

- Strychnine hydrochloride.
- Warfarine.

3) Nematocides:

These are those pesticides which are used to kill nematodes like Ascaris etc.
For example:

- Dibromo chloropropane.
- Fensul fothion.

4) Fungicides:

These are those pesticides which are used to kill fungi.
For example:

- Bordeaux mixture.
- Sulphor.

5) Weedicides:

Herbs

These are those pesticides which are used to kill weeds. These are also known as herbicides.
For example:

- Dichlorophenoxy acetic acid.
- Dichloropropionanilide.

Notes/5 marks

Hazards of Pesticides:

- Mishandling of pesticides during their use can kill the farmers.
- These also kill the beneficial insects and animals.
- These can cause the skin cancer.
- These are also the main source of environmental pollution.
- People are using pesticide as suicidal agent.
- Some pesticides are not easily degradable, so they remain in the environment for longer period of time. for example DDT.
- Insecticides can enter into the fruits and interns enter into the bodies of human beings and cause different diseases.

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Pollen Allergy

Prepared by Muhammad Atif Ali

Allergy:

Allergy is the abnormal reaction of anybody to substances or situations which are harmless to other people.

Pollens:

These are grains which are part of male reproductive system of plants.

Definition of pollen allergy:

The allergy which is caused by pollen grains is called pollen allergy.

Explanation:

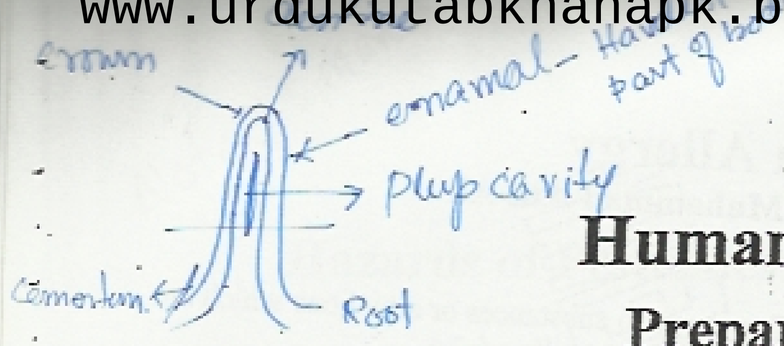
In spring a large number of pollen grains are present in the atmosphere. They enter human nose and throat and cause a seasonal pollen allergy.

Symptoms:

- Sneezing
- Itching eyes, nose and throat.
- Dark circles under the eyes.
- Watering eyes.
- Inflammation of the eyelids.

Preventive measures:

- Migrate from one place to another place where those plants are present which do not transfer their pollens through air (move from hilly areas to seashores).
- Remain indoors during windy days.
- Wear face masks.
- Use of air conditioners inside the home and car can be quite helpful in reducing pollen levels.
- Other air filtering devices (high efficiency particulate air) should be used in home and car.
- Those devices which produce ozone should not be used, because ozone is the main irritant in the nose.
- Patients should try to avoid unnecessary exposure to dust, insect spray, smoke, air pollution and paint.



Human Teeth

Prepared by

Muhammad Atif Ali

Structure of tooth:

The visible portion of the tooth is called the crown. The portion of the tooth that lies beneath the gum line is the root.

Human teeth are made of four distinct types of tissue: enamel, dentin, pulp, and cementum.

Enamel, the clear outer layer of the tooth above the gum line, is the hardest substance in the human body. In human teeth, the enamel layer is about 0.16 cm (about 0.06 in) thick and protects the inner layers of the teeth from harmful bacteria and changes in temperature from hot or cold food.

Directly beneath the enamel is dentin, a hard, mineral material that is similar to human bone, only stronger.

There is cavity beneath the Dentin called pulp. Pulp contains blood vessels, which carry oxygen and nutrients to the tooth, and nerves, which transmit pain and temperature sensations to the brain.

The outer layer of the tooth that lies below the gum line is cementum, a bonelike substance that anchors the tooth to the jawbone.

(1) Hetrodont means different types of the teeth in human

(2) Homodont means same types of teeth of animals

Human teeth are made of four distinct types of tissue:-

(i) Enamel:- hardest outer layer of the teeth.

(ii) Detentin- ~~det~~ dentin come beneath the enamel- its also a stronger material.

(iii) Pulp:- beneath dentine- Pulp - Contain on blood vessel which carry O and nutrients to the too

(iv) Cementum, This part lies below the gum. made of bone like substance.

Incisors (2) teeth

Teeth (1) (To chew food.) Canine

2. Premolar (To grind)

Molar 3.

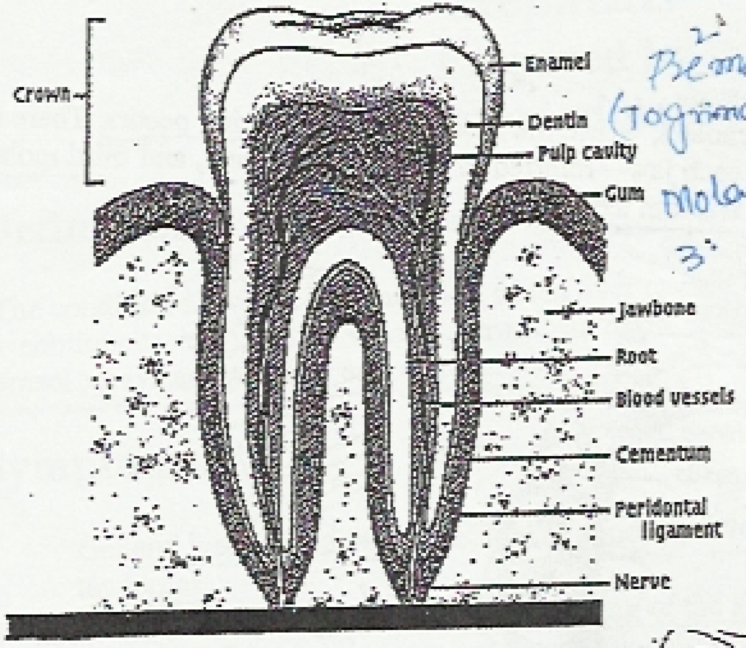
I = 2

c = 1

P.m = 2

m = 3

8



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Types of Human Teeth

Adult humans typically have 32 teeth—16 in the upper jaw and 16 in the lower jaw—that fit together and work in concert to chew food. Teeth on the right side of each jaw are usually identical to the teeth on the left side and matching teeth on opposite sides are referred to as sets, or pairs.

Humans are heterodonts—that is, they have teeth of different sizes and shapes that serve different functions, such as tearing and grinding. In contrast, the homodont teeth found in many animals are all the same size and shape, and perform the same function.

Humans have four types of teeth, each with a specific size, shape, and function.

(1) Incisors: 4 + 4

Adult humans have eight incisors, located at the front of the mouth—four in the upper jaw and four in the lower jaw. Incisors have a sharp edge that is used to cut food.

(2) Canines: 2 + 2

On either side of the incisors are the canines, named for their resemblance to the pointy fangs of dogs. The upper canines are sometimes called eyeteeth. There are two canines in each jaw, and their primary role is to tear food. //

(3) Premolar: 4 + 4

Behind the canines are premolars, flat teeth with pronounced cusps that grind and mash food. There are two sets, or four premolars, in each jaw.

(1) Milk teeth = After birth 7th month. 20 milk teeth

(2) Permentant teeth: ~~Strat~~ Starts 7th year

(3) Wisdom teeth starts 21 to 25 age = Total 4 teeth

(4) Natal teeth: at the time of birth ⇒ 1-2 teeth exceptional

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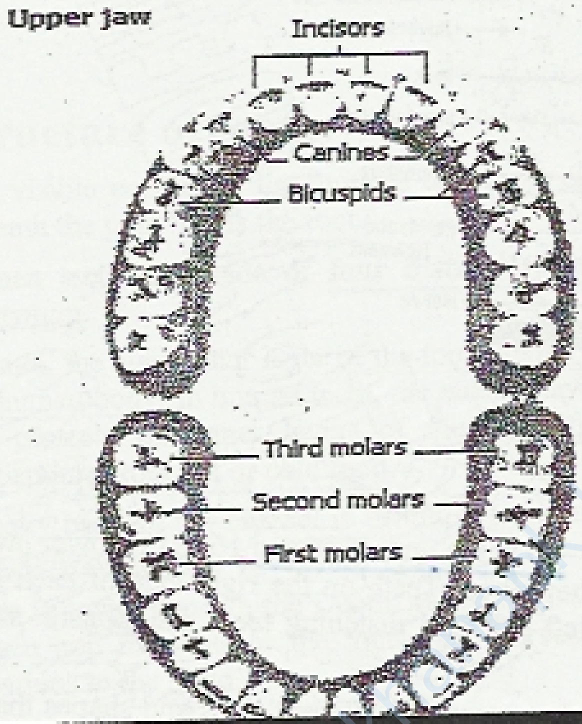
Molar: 6 +6

Behind the premolar are the molars, where the most vigorous chewing occurs. There are twelve molars—three sets in each jaw—referred to as the first, second, and third molars. Third molars are often called wisdom teeth.



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Tooth Development:

Deciduous teeth:

Humans are diphyodont—that is, they develop two sets of teeth during their lives. The first set of teeth is the deciduous teeth, 20 small teeth also known as baby teeth or milk teeth. Deciduous teeth start developing about two months after conception and typically begin to erupt above the gum line when a baby is six or seven months old. Occasionally a baby may be born with one or more deciduous teeth at birth, known as natal teeth.

Permanent teeth:

By the time a child is six years old, a second set of 32 larger teeth, called permanent teeth, start to erupt, or push out of the gums, eventually replacing the deciduous teeth.

Wisdom teeth usually erupt by the age of 21.

Hepatitis

Prepared by
Muhammad Atif Ali

Definition:

"The condition in which inflammation of the liver caused by viruses, bacterial infections, or continuous exposure to alcohol, drugs, or toxic chemicals, such as those found in aerosol sprays and paint, is called Hepatitis"

Symptoms:

- General weakness and fatigue, loss of appetite, fever, and abdominal pain and tenderness.
- Another symptom is jaundice, a yellowing of the skin and eyes that occurs when the liver fails to break down excess yellow-colored bile pigments in the blood.

What are the functions of liver which are stopped by Hepatitis?

Hepatitis reduces the liver's ability to perform life-preserving functions, including filtering harmful infectious agents from the blood, storing blood sugar and converting it to usable energy forms, and producing many proteins necessary for life.

Types of Viral Hepatitis:

Hepatitis A virus (HAV)

It lives in feces in the intestinal tract.

How it spreads:

- It is spread when infected individuals do not wash their hands after using the toilet and then handle food.
- When a person changes an infected infant's diapers and then handles food before

washing his or her hands. People who eat this contaminated food run a high risk of becoming infected.

- The virus also spreads when drinking water is contaminated with raw sewage. When people use contaminated water for drinking, as ice, or to wash fruits or vegetables, they run the risk of contracting HAV. Eating raw or partially cooked shellfish harvested from water contaminated with raw sewage can also lead to HAV infection.

Symptoms:

- In addition to the general hepatitis symptoms, such as nausea, fatigue, and jaundice, hepatitis A may also cause diarrhea.

Treatment:

- There is no treatment for hepatitis A. Most people will recover on their own without any serious aftereffects.
- Although a few severe cases may require a liver transplant.

The Hepatitis B virus (HBV)

- It lives in blood and other body fluids.

How it spreads:

- HBV is transmitted from person to person through unprotected sexual intercourse with an infected person
- Through the sharing of infected needles or other sharp instruments that break the skin.
- Babies born to an infected mother have a 90 to 95 percent chance of contracting HBV during childbirth.

Treatment:

- Although researchers are investigating promising new treatments for hepatitis B, the only one currently available is interferon, a drug that is effective in only 35 to 40 percent of patients treated.
- Liver transplants may be beneficial ~~to~~ for infected patients, but the virus remains in the body after transplantation ~~surgery and~~ may eventually attack the new liver.

The Hepatitis C virus (HCV)

Interf[illegible] virus from causing [illegible]

How it spreads:

- It is a slowly progressing infection that is primarily spread by intravenous drug users.
- HCV can also be spread through the sharing of toothbrushes, razors, and contaminated needles with an infected person; through unprotected sex with an infected person; and from mother to child during childbirth.

Treatment:

- Interferon is also used to treat HCV, but it is effective in only 20 to 30 percent of cases.
- The therapy, a combination of interferon and the antiviral drug ribavirin, has been approved to treat hepatitis in those people who relapse after treatment with interferon.

General Preventions:

- Safe and effective vaccines are available to prevent hepatitis A and B infection.
- Immune globulin injections can also prevent hepatitis A and B infection if they are given within two weeks of exposure.
- There are currently no vaccines available to prevent infection with HCV, HEV, and HGV.
- The best protection against these viruses is to avoid high-risk activities, including preventing exposure to body fluids of infected individuals, and always washing hands after using the toilet or changing an infant's diapers.

Rabies

Prepared by

Muhammad Atif Ali

Introduction:

Rabies is an acute, contagious infection of the central nervous system, caused by a specific virus that enters the body through the bite of an animal.

All warm-blooded animals are susceptible, but in North America the disease is most common in foxes, bats, dogs, and cats. Most of the cases of rabies in humans are caused by the bite of one of these animals.

The incubation period in humans varies from three weeks to 120 days, with an average of about four to six weeks. Rabies is virtually always fatal when vaccine is not administered.

Symptoms:

At the end of the incubation period the site of the now healed wound becomes irritated and painful, and the local tissues may become numb. Depression and anxiety are common. This initial stage lasts for about two days. In the next stage, the period of excitation, the patient becomes irritable and hypersensitive, difficulty in breathing and swallowing, caused by spasmodic contractions of the diaphragm and larynx. The patient is extremely thirsty but experiences spasms of the larynx when water is presented or even mentioned, whence the original name of the disease, hydrophobia (Greek *hydor*, "water"; *phobos*, "fear"). Vomiting, and fever of about 39° C (102° F) are common during this stage. A thick secretion of mucus collects in the mouth and throat, and the individual expectorates frequently or attempts to cough. This stage lasts three to five days and usually terminates in death from cardiac or respiratory failure.

Prevention and treatment:

In 1884 the French bacteriologist Louis Pasteur developed a preventive vaccine against rabies, and modifications of Pasteur's methods are still used in rabies therapy today. The Pasteur program, or variations of it, has greatly reduced the fatalities in humans from rabies.

Modern treatment, following a bite by a rabid or presumed rabid animal, consists of immediate and thorough cleansing of the bite wound and injection into the wound and elsewhere of hyperimmune antirabies serum. A 14- to 30-day course of daily injections of rabies vaccine is then given; booster doses are given 10 days after this course and again 20 days later.

Addison's disease

Introduction:

Addison's Disease, chronic endocrine disorder resulting from underactive adrenal glands that do not produce enough corticosteroid hormones. The disease was first described by the British physician Thomas Addison in 1855. Adrenal glands may be adversely affected by a severe infection, such as tuberculosis, massive bleeding of the adrenals or surgery affecting the glands, such as removal of a tumor, but in most cases the origin of the disease is unknown.

Symptoms:

The resulting lack of hormone secretion causes such symptoms as weakness and fatigue, weight loss, low blood pressure, gastrointestinal distress, low blood sugar, depression and irritability, and increased skin pigmentation.

Treatment:

The disease occurs in all age groups and afflicts men and women equally. Once inevitably fatal, the disease is now treated effectively with daily doses of cortisone or hydrocortisone and additional salt in the diet.

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Smallpox

Prepared by

Muhammad Atif Ali

Introduction:

Smallpox, highly contagious viral disease that is often fatal. The disease is chiefly characterized by a skin rash that develops on the face, chest, back, and limbs. Over the course of a week the rash develops into pustular (pus-filled) pimples. In the latter stages of nonfatal cases, smallpox pustules become crusted, often leaving the survivor with permanent, pitted scars.

The smallpox viruses belong to a virus group known collectively as orthopoxviruses, also referred to more simply as pox viruses—the largest viruses known. These are DNA virus's.

How it spreads?

Smallpox is caused by a virus. An infected person spreads virus particles into the air in the form of tiny droplets emitted from the mouth by speaking, coughing, or simply breathing. The virus can then infect anyone who inhales the droplets. By this means, smallpox can spread extremely rapidly from person to person.

Course in the body and Symptoms:

After a person is infected with the smallpox virus, about 12 days pass before the person begins to feel sick, a time known as the incubation period. During the incubation period, while the infected person still feels healthy, the smallpox virus multiplies in the lymph nodes, lungs, and other tissues. By the 12th day the virus moves into the bloodstream, producing sudden and dramatic symptoms that include high fever of 39° to 41°C (102° to 106°F), headache, muscular and abdominal pain, and vomiting. Within two to three days the virus spreads to the skin and the rash appears. At first the rash takes the form of skin spots known as macules. By the second day of the rash, as infection worsens within the skin cells, the spots become raised lesions called papules; by the seventh day these papules fill with pus and are referred to as pustules. Smallpox patients become most infectious during the week following the appearance of the rash.

In the most extreme forms of smallpox, the virus causes bleeding underneath the skin, giving the skin a burning appearance. In these cases the virus causes massive tissue damage to skin and to internal organs, and victims bleed heavily from the mouth and other body openings. Such cases are referred to as black pox and they are almost invariably fatal.

The exact cause of death in smallpox cases is not entirely understood, but it can include shock, cardiovascular complications, and bacterial toxins from secondary infections. In those who survive the illness, the infection runs its course in about two weeks; the pustules form scabs and finally drop off within roughly a month.

Treatment:

There is no cure, or even a specific treatment, for a smallpox infection. In modern outbreaks, medical care usually consisted of bed rest and the treatment of symptoms: the use of intravenous fluids to prevent dehydration, sedatives to keep patients calm, and aspirin or codeine to relieve pain in the head and muscles. Antibiotic drugs such as penicillin or tetracycline were also administered to treat secondary bacteria infections. In an effort to minimize scarring of the skin, smallpox lesions were kept clean with warm antiseptic baths and dusting powders.

Only vaccination is the best treatment against small pox.

History of Vaccine:

A more effective medical blow against smallpox, and one of history's landmark biomedical achievements, took place in 1796 with an experiment performed by the British physician **Edward Jenner**. He had observed that young women who milked cows for a living often contracted a minor skin infection known as cowpox—and that these milkmaids subsequently seemed to be protected from smallpox. Jenner arranged to perform an experiment on eight-year-old James Phipps, scratching his arm with pus taken from the cowpox lesion of a milkmaid. Six weeks later, when Jenner scratched Phipps's arm with pus from a smallpox lesion, the boy failed to show any reaction or illness. The cowpox virus had created natural immunity against smallpox while carrying none of the risk posed by variolation with actual smallpox virus. Thus, with this new procedure, which was later dubbed vaccination (from the Latin word *vacca* for "cow"), Jenner set the course that ultimately led to victory over smallpox.

DNA ⇒ De-oxy-ribo Nucleic Acid
De-oxy-ribo Nucleic Acid
De-oxy-ribo Nucleic Acid
De-oxy-ribo Nucleic Acid.

RNA ⇒ Ribo Nucleic Acid.
Ribo Nucleic Acid
Ribo Nucleic Acid
Ribo Nucleic Acid.

Typhoid

Prepared by

Muhammad Atif Ali

Introduction:

- Typhoid Fever, acute infectious disease caused by bacteria called *Salmonella typhi*. The bacteria is transmitted by milk, water, or solid food contaminated by feces of typhoid victims or of carriers.
- The World Health Organization (WHO) estimates that globally some 16 million cases of typhoid fever occur annually, causing 600,000 deaths.

Symptoms:

The incubation period of typhoid fever lasts one to three weeks. The bacteria collect in the small intestine, from which they enter the bloodstream. This induces the first symptoms, chills followed by high fever. Victims may also experience headache, cough, vomiting, and diarrhea. The disease spontaneously subsides after several weeks in most instances, but in about 20 percent of untreated cases the disease progresses to pneumonia, intestinal hemorrhage, and even death.

Treatment:

Deaths from typhoid fever were greatly reduced by the isolation of the first antibiotic effective against the typhoid bacillus, chloromycetin, or chloramphenicol, prepared in the late 1940s. This drug is still the preferred treatment in most cases. For infection with typhoid resistant to chloramphenicol or for treatment of carriers, ampicillin is recommended.

Control:

- Compulsory inspection of milk and water supplies, and the pasteurization of milk in particular, have greatly reduced the incidence of the typhoid bacilli.
- Of equal importance in the control of typhoid fever has been the recognition of carriers, who can then be prevented from handling food, and improvement of sewage facilities.
- Another important factor in the control of typhoid fever is typhoid inoculation of persons exposed to the disease, such as hospital employees and travelers to areas with poor sanitary facilities.

Chemical Composition of a Mammalian cell

Components	Percentage
Water	70
Proteins	18
Carbohydrates	4
Lipids	3
DNA	0.25
RNA	1.1
Other organic molecules	2
Inorganic ions	1

Percentage composition of Bio-elements by mass of a human being

Elements	Percentage
Oxygen	65%
Carbon	18%
Hydrogen	10%
Nitrogen	3%
Calcium	2%
Phosphorous	1%

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Measles

"Measles, also called Rubeola, acute, highly contagious, airborn, fever-producing disease caused by a virus called **Paramyco virus**."

Symptoms:

- Measles is characterized by small red dots appearing on the surface of the skin, irritation of the eyes (especially on exposure to light), coughing, and a runny nose.
- About 12 days after first exposure, the fever, sneezing, and runny nose appear.
- Coughing and swelling of the neck glands often follow.
- Four days later, red spots appear on the face or neck and then on the trunk and limbs.
- In 2 or 3 days the rash subsides and the fever falls; some peeling of the involved skin areas may take place. Infection of the middle ear may also occur.
- Measles was formerly one of the most common childhood diseases.
- According to the World Health Organization (WHO), about 1 million children die from measles each year. The virus may spread to the brain, and can cause death or brain damage.

Treatment:

No specific treatment for measles exists except vaccination. Patients are kept isolated from other susceptible individuals, usually resting in bed, and are treated with aspirin, cough syrup, and skin lotions to lessen fever, coughing, and itching. The disease usually confers immunity after one attack, and an immune pregnant woman passes the antibody in the globulin fraction of the blood serum, through the placenta, to her fetus.

Poliomyelitis

The term *poliomyelitis* derives from Greek words referring to inflammation (*itis*) of the gray (*polios*) matter of the spinal cord (*myelos*).

It is infectious viral disease that sometimes results in paralysis. The infection chiefly affects children and young adults and is caused by any one of three related viruses called polioviruses.

How Polio develops?

There are three types of poliovirus which have been identified.

Type 1 (also known as Brunhilde).

Type 2 (Lansing).

Type 3 (Leon).

Type 1 is the most common form and the one most closely associated with polio's more severe, paralytic progression.

Poliovirus typically enters the body through the mouth and multiplies in the tonsils and lymph nodes of the upper respiratory tract. Infection proceeds from the mouth into the gastrointestinal tract through the stomach to the intestines. The virus multiplies in the intestines and is shed from the body in feces, often resulting in further infections. For example, a parent can become infected by an infant during diaper changes, or improper waste disposal can lead to contamination of a water supply. These infections, in turn, will spread the virus more widely.

Large quantities of poliovirus multiply in intestinal tissue, where cells of the body's lymphatic system are concentrated. Passage of the virus into the body's lymphatic system stimulates the production of antibodies. These specialized immune-system defenders, in time, will destroy the viral intruder. From the lymphatic system, the virus typically invades the bloodstream.

Types of Polio Diseases and their Symptoms:

Once the virus enters the bloodstream, the virus may cause one of four types of illnesses marked by varying severity.

1) Some infections result in *abortive poliomyelitis*, a mild form of the disease characterized by fever, headache, sore throat, fatigue, nausea, and vomiting. This short-lived form of the illness lasts only from hours to a few days. In more than 95 percent of cases, the disease gets no worse. Sometimes, however, the virus may

invade the nervous system, causing more severe forms of the disease.

2) Some poliovirus infections of nerve cells, or neurons, result in ***non-paralytic poliomyelitis***. In addition to the fever and other symptoms seen in abortive poliomyelitis, non-paralytic poliomyelitis causes pain and stiffness in the neck and back. This infection typically produces aseptic meningitis—an inflammation of the membranes that surround the brain and spinal cord. As with abortive poliomyelitis, however, symptoms from non-paralytic polio usually subside within a few days without causing permanent damage.

3) In perhaps 1 or 2 percent of cases a more disabling form of the disease occurs, called ***paralytic poliomyelitis***. In this form viral infection of neurons in the spinal cord may cause temporary damage to these cells—or permanent destruction. The muscles activated by the involved neurons become painful, and muscular weakness in the arms and legs may develop, sometimes followed by paralysis.

4) In the most serious cases of polio infection the virus attacks the brain, causing ***bulbar poliomyelitis***. Various nerves in the head and face, including those that send signals to the ears, eyes, and the muscles controlling chewing and swallowing, may be affected. Sometimes the virus affects the part of the brain that controls breathing and heartbeat, resulting in death.

Diagnosis:

- Doctors diagnose polio by isolating the virus from an infected person using throat cultures, stool samples, or samples of fluids from the brain and spinal cord.
- Blood tests that indicate the presence of antibodies specific for the virus will also confirm a poliovirus infection.

Treatment:

- As yet there is no cure for polio—no drug or other medical treatment can halt the destruction of poliovirus in the body. However, several medical treatments can lessen the severity of the disease.
- Mild cases of polio do not require specific treatment.
- For the more serious cases of paralytic polio, keeping patients still and quiet can, in some cases, minimize the severity of paralysis. Simple treatments, including moist heat applied to affected muscles, can ease pain.
- One of the most immediately dangerous complications of paralytic polio is loss of the ability to breathe due to the damage in the area of the brain that controls breathing. Artificial respirator can be used to treat those patients.
- Physical therapy can also be used to treat Polio.

Sabin oral vaccine should be used to prevent this disease.

AIDS

Prepared by
Muhammad Atif Ali

What do AIDS mean?

AIDS stand for Acquired Immune Deficiency Syndrome

1. Acquired means you can get infected with it
2. Immune Deficiency means a weakness in the body's system that fight against diseases
3. Syndrome means a group of health problems that make up a disease

It is a collection of symptoms or infections resulting from the specific damage to the immune system caused by the HIV in humans.

Discovery / symptoms:

Physicians first reported it in 1980 (young male)

Symptoms include:

- Severe pneumonia (lungs cancer)
- Sudden weight loss
- Swollen lymph nodes
- Fever
- Night sweats
- CMV stands for cytomegalovirus (infection in eyes)
- Brain tumor

General loss of immune system

Cause: (HIV)

1984 research team from Pasteur institute in France and NIH in USA

1986 named as HIV (**stands for Human Immune Deficiency Virus**)

- Someone who is diagnosed as infected with HIV is said tue be **HIV positive**
- HIV: Retrovirus type - single stranded RNA tumor virus (figure- structure of HIV)
- Host specific
- Major cell infected by HIV is **CD4 cells (helper- lymphocytes)**
- It is major component of immune system and required for its proper functioning.
- When HIV kills CD4 cells, there is decrease in number of cells and when its number reaches to less than **200 CD4 cells per ml** of blood, cellular immunity is lost.
- The infected person becomes susceptible to other diseases (as body has very little defense against any type of infection)
- HIV has number of tricks that help it to evade the body's defense - including very rapid mutation. Once HIV has taken hold the immune system can never fully get rid of it. (Figure - infection cycle of HIV)
- In this way it is destroying immune system and that's why AIDS is also known as **'mother of all the diseases'**
- Viruses, fungi, parasites and bacteria that usually don't cause any problems can make you very sick if immune system is damaged.

Diagnose:

- Counting CD4 cells in the blood (**healthy people 500 - 1500**) number less than 200 cells indicate HIV infection
- Presence of certain infections

Transmission / ways of infection:

The blood, vaginal fluid, semen, breast milk of people infected with HIV has enough of the virus in it to infect other people.

It can be transmitted by:

- Intimate sex contact
- Contact with infected blood
- Breast feeding (can be transmitted into child from infected mother during pregnancy, delivery)
- Health care workers
- Sharing a needle with someone who is infected

It is not possible to become infected with HIV through:

- ✓ Sharing crockery
- ✓ Touching, hugging or shaking hands
- ✓ Eating food prepared by someone with HIV
- ✓ No documented cases of HIV being transmitted by tears and saliva

BUT

It is possible to be infected with HIV through oral sex if you have open sores in your mouth or bleeding gums

Prevention:

Avoiding direct contact with HIV is very important and can be done by:

- Prevention of intravenous drugs with common syringes
- Drugs user should not share needles and other materials required
- Medical workers should follow universal precautions
- Being faithful, especially for those who are in committed relationships

Treatment:

- No cure
- Drugs can slow down the HIV, it can slow down the damage to your immune system, but there is no way to clear HIV out of the body
- Drugs can be used to prevent infections
- Vaccine has been synthesized and its experimental administration in humans has been started in 2001 in South Africa. But they are not effective as virus can mutate

So as there is no way to cure AIDS and at the moment:

"The only way to remain safe is not to become infected"

CARE IS BETTER THAN CURE

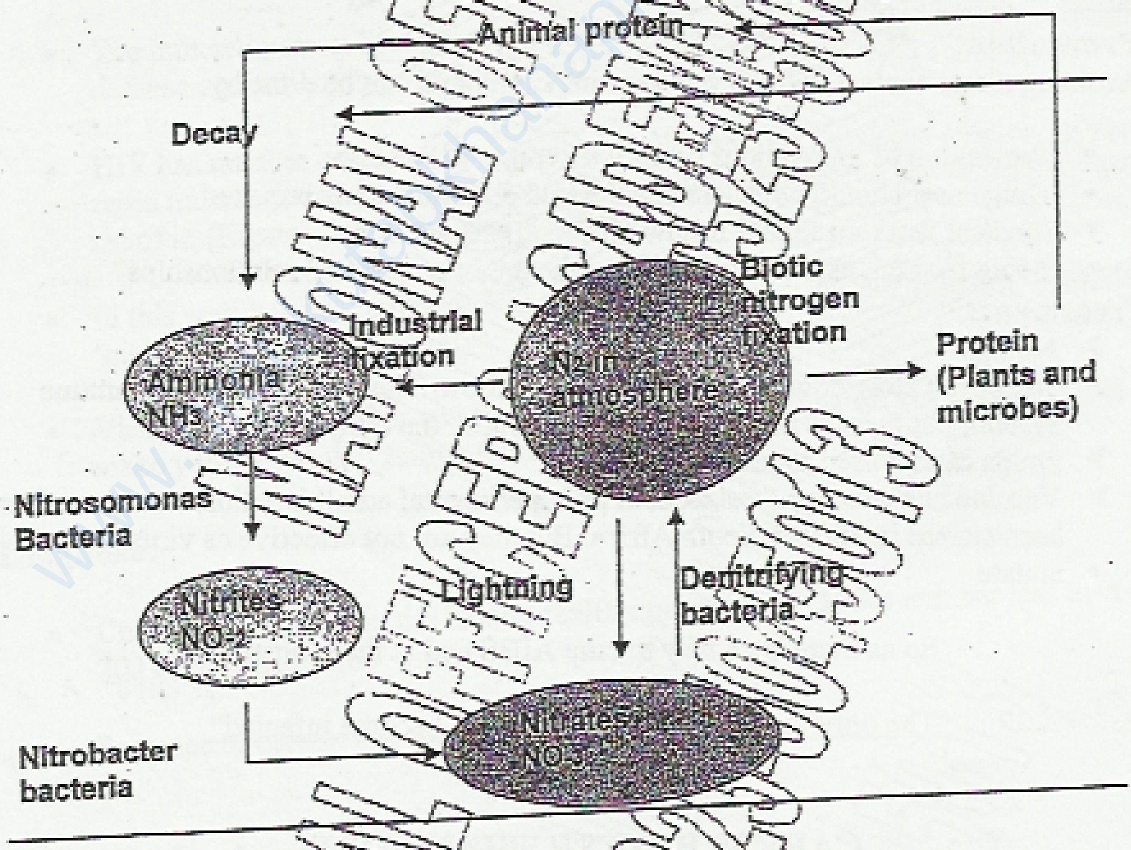
The Nitrogen Cycle

"The process by which 78% of nitrogen is circulated and re-circulated throughout the world of living organisms is known as nitrogen cycle".

- All life requires nitrogen-compounds, eg. Proteins and nucleic acids.
- Air, which is 78% nitrogen gas (N_2), is the major reservoir of nitrogen.
- But most organisms cannot use nitrogen in this form.
- Plant must secure their nitrogen in "fixed" form, i.e., incorporated in compounds such as:
  1-nitrate ions (NO_3) 2-ammonia (NH_3) 3-urea $(NH_2)_2CO$
- Animals secure their nitrogen (and all other) compounds from plants (or animals that have fed on plants).

Four processes participate in the cycling of nitrogen through the biosphere (living world):

- Nitrogen fixation
- Ammonification
- Nitrification
- Nitrogen assimilation
- Denitrification


Animal protein
Decay
Ammonia NH3
Industrial fixation
N2 in atmosphere
Biotic nitrogen fixation
Protein (Plants and microbes)
Nitrosomonas Bacteria
Nitrites NO-2
Lightning
Denitrifying bacteria
Nitrates NO-3
Nitrobacter bacteria

The Nitrogen Cycle

Microorganisms play major roles in all four of these.

Nitrogen fixation

Three processes are responsible for most of the nitrogen fixation in the biosphere:

- **Atmospheric fixation** by lightning
- **Biological fixation** by certain microbes-alone or in a symbiotic relationship with some plants and animals.
- **Industrial fixation** in fertilizers

Atmospheric fixation

The enormous energy of lightning breaks nitrogen molecules and enables their atoms to combine with oxygen in the air forming nitrogen oxides. These dissolve in rain, forming nitrates that are carried to the earth. Atmospheric nitrogen fixation probably contributes some 5-8% of the total nitrogen fixed.

Biological fixation

The ability to fix nitrogen is found only in certain bacteria.

- Some live in a symbiotic relationship ***(Rhizobium)*** with plants of the legume family (e.g., soyabean, pea).
- Some establish symbiotic relationship with animals, e.g., **termites** and **"shipworms"**(wood eating bivalves).
- Some nitrogen fixing bacteria ***Azotobacter*** (aerobic), ***Clostridium*** (anaerobic) live free in soil.
- Nitrogen-fixing cyanobacteria (*Nostoc, Anabena*) are essential to maintaining the fertility of semi-aquatic environments like rice paddies.

Biological nitrogen fixation requires a complex set of enzymes and a huge expenditure of ATP. Although the first stable product of the process is ammonia, this is quickly incorporated into protein and other organic nitrogen compounds.

Industrial fixation

Large amount of nitrogen fixed in the form of fertilizers produced at industrial level.

Ammonification

The proteins made by plants enter and pass through food webs just as carbohydrates do. At each trophic level, their metabolism produces organic nitrogen compounds that return to the environment, chiefly in excretions like urea, uric acid etc., .The final beneficiaries of the materials are **ammonifying bacteria**. They break down the molecule in excretions and dead organisms into **ammonia.**

Nitrification

Ammonia can be taken up directly by plants- usually through their roots. However, most of the ammonia produced by decay is converted into **nitrates**. This is accomplished into two steps:

- Bacteria of the genus ***Nitrosomonas*** oxidize NH3 to **nitrites** (NO-$_2$).
- Bacteria of the genus ***Nitrobacter*** oxidize the nitrites to **nitrates** (NO-$_3$).

These two groups of autotrophic bacteria are called **nitrifying bacteria.** Thro activities (which supply them with all their energy needs), nitrogen is made av the roots of plants.

Many legumes, in addition to fixing atmospheric nitrogen, also perform nitrification converting some of their organic nitrogen to nitrites and nitrates. These reach the soil hen they shed their leaves.

Nitrogen assimilation

Plants use nitrogen in the form of nitrates, which on reduction forms ammonia. Plant cells absorb ammonia in amino (NH_2) from. The ammonia even becomes a part of amino acid which in turn forms proteins. Proteins from the plants are used by animals as their food. These supply amino acid necessary for the metabolism of animals.

Denitrification

The three processes above remove nitrogen from the atmosphere and pass it through ecosystems. Once again, bacteria (*Pseudomonas*) are the agents. They live deep in soil and in aquatic sediments where conditions are anaerobic. They use nitrates as an alternative to oxygen for the final electron acceptor in their respiration. Thus they close the nitrogen cycle.

Nitrogen enrichment

Agriculture may now be responsible for one-half of the nitrogen fixation on earth through

- The use of fertilizers produced by industrial fixation
- The growing of legumes like soybeans and alfalfa.

Certainly, there are examples of nitrogen enrichment in ecosystems. One troubling example: the "blooms" of algae in lakes and rivers as nitrogen fertilizers leach from the soil of adjacent farms (and lawns). The accumulation of dissolved nutrients in a body of water is called **Eutrophication.**

Physics

Prepared by
Muhammad Atif Ali

Definition:

"It is branch of science which deals with matter and energy".

Main Branches

Mechanics:

It deals with the motion of particles or bodies under the action of given forces.

Solid-State Physics:

It is concerned with properties of solid material.

Atomic Physics:

It is concerned with the structures and properties of atoms.

Nuclear Physics:

It is concerned with the structures and properties of Nucleus of an atom.

Astrophysics:

It is concerned with the application of modern physics to the astronomical phenomena.

Electromagnetism:

It is concerned with the observations and laws relating to electricity and magnetism.

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Isotopes are different element which have the same atomic number but different mass number"

Isotopes

Prepared by
Muhammad Atif Ali

Definition:

"Isotopes are different types of an element which have the same atomic number but different mass number".

Explanation:

Some isotopes are radioactive (emit radiations) so, they are called radioactive isotopes.
Chemical properties of isotopes are same but their physical properties are different.
There are large numbers of elements which have isotopes, for example, Hydrogen, Carbon, Uranium etc.
Radioactive isotopes emit alpha, beta or gamma radiation.
Radioactive isotopes continuously emit radiations; as a result they get transfer from one element to new element.
The element emitting radiations is known as **parent element**.
The element formed as the result of emission of radiations is called **daughter element**.
Half Life.
The time interval in which half of the atoms of an element decay into daughter elements is known as the **half life** of that element.

Isotopes of Hydrogen:

There are three isotopes of Hydrogen, Protium, Deuterium and Tritium.

Protium:

| Protium | Deuterium = Tritium

Protium is the ordinary Hydrogen which is present in the atmosphere and in water.
It has one electron, one proton and no neutron.

Deuterium:

It has one electron, one proton and one neutron.
It is present in heavy water.

Tritium: Artificially prepared.

It has one electron, one proton and two neutrons.
Its atomic number is one while atomic weight (mass number) is three.
It is not present in atmosphere but it is artificially prepared.
It is the radio active isotope of Hydrogen.

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Protium NO **Deuterium** N1 **Tritium** N2 = (Radioactive Isotope)

Protium - Deuterium - Tritium

Isotopes: Same atomic Number but Different mass No-

Isotopes are different types of element which have the same atomic numbe
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Protium NO **Deuterium** N_1 **Tritium** N_2 = (Radioactive Isotope)

Protium - Deuterium - Tritium

Isotopes: Same atomic Number but Different mass No-

Nuclear Fission

Prepared by
Muhammad Atif Ali

NATIONAL TEACHERS ACADEMY

Definition:

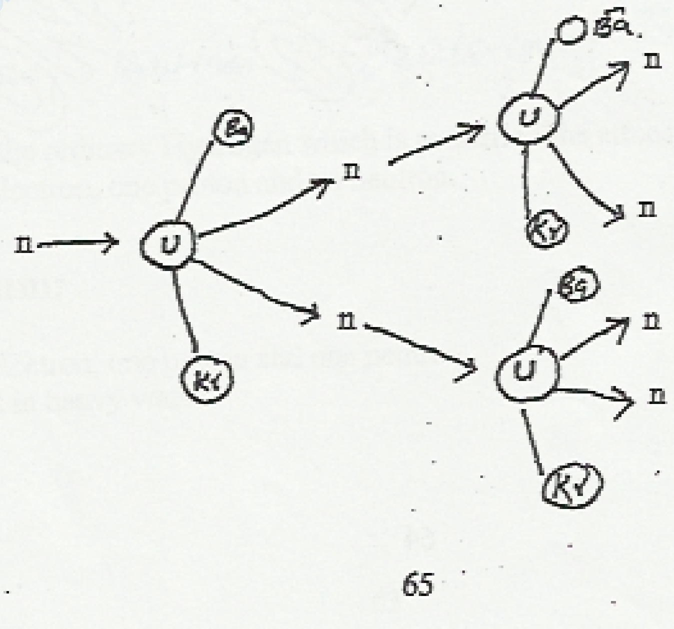
"The splitting of a nucleus into fragments with the emission of energy when bombarded by a neutron is called nuclear fission".

Explanation:

1 Otto Hahn and Fritz Strassman in the year 1938 discovered nuclear fission process when they bombarded nucleus of uranium with a neutron.
2 Neutron broke down the nucleus of uranium into two atoms of Krepton and Barium
3 and produced large amount of energy along with two neutrons.
4 Later on this process was repeated by two other German scientists, Meither and Otto Frisch and observed similar results.
5 The energy released during each fission of nucleus is equal to 200 MeV.
6 The two neutrons which are released during fission of one nucleus of uranium, collide with the adjoining nuclei of uranium and repeat the same process, this is called chain reaction.
7 In nuclear fission process only Uranium having atomic number 92 and atomic weight 235 is used.
8 This process is used in making atomic bomb.
9 Natural sample of uranium contains 0.7% Uranium with atomic number 235 and 99.3% uranium with atomic number 238.

Nuclear fission process in the form of equation is given below.

$$U^{235}_{92} + n \rightarrow Ba^{141}_{56} + Kr^{92}_{36} + 3n + \text{Energy (200Mev)}$$



Nuclear Fusion

Prepared by
Muhammad Atif Ali

1/1000

Definition:

"It is that process in which two lighter nuclei are brought together to form a heavier nucleus".

Explanation:

Mass

1 In this process deuterium and tritium nuclei are brought together to form helium nucleus.
2 In this process large amount of energy and a neutron is released.
3 In nuclear fusion process the sum of the masses of the helium nucleus and the neutron is less than the sum of masses of the deuterium and tritium nuclei.
4 This mass difference is released in the form of energy because mass and energy are inter-convertible.

#

5 This process can be represented in the form of equation as following

$$ {}_1H^2 + {}_1H^3 \rightarrow {}_2He^4 + n + \text{energy} $$

6 The major difficulty in getting a fusion reaction to take place is that two positive charged nuclei have to be brought together to cause the reaction.
7 For this purpose the two nuclei must have a huge kinetic energy to overcome the force of repulsion between two nuclei.
8 The only way to supply so much huge amount of energy is by heating.
9 A temperature of one million degree centigrade is required for this purpose.
10 This temperature cannot be created on the earth through any mean except nuclear fission process.
11 So, for the start of nuclear fusion process one must have to start nuclear fission process, because in nuclear fission process, more than one million ^0C temperature can be created.
12 Nuclear fusion process is taking place on the surface of the earth.
13 **Hydrogen bomb** is based on the principle of nuclear fusion process.
14 The first hydrogen bomb was exploded in 1952 by America

Heavy Water

1/7000

Prepared by
Muhammad Atif Ali

NATIONAL ACADEMY 0323-5311013

1. It is a naturally occurring substance and is present in ordinary water in the proportion of one part in seven thousand (7000) parts of ordinary water.
2. It was discovered by the American chemist H.C Urey in early 1930s.
3. In heavy water deuterium isotope of hydrogen is used.
4. It is called heavy water because deuterium has one extra neutron than protrium which is used in ordinary water.
5. So, its weight is 10% more than the ordinary water.
6. Its taste is similar to ordinary water.
7. Its chemical formula is D_2O.

Mcqs

Comparison B/W H_2O and D_2O

Property	Ordinary water	Heavy water
Formula	H_2O	D_2O
Density	1.0 g/ml	1.11g/ml
Freezing point	0.0 °C	3.8 °C
Boiling point	100 °C	101.4 °C

Uses of D_2O:

1. It is used in nuclear reactor as moderator for slowing down the neutrons.
2. It is used as tracer in biological and chemical researches.
3. It is used as source of heavy hydrogen for hydrogen bomb.

(1) Abbr
(2) Diff
(3) Diff Parts.
  (1) Active medium such as Ruby Rod.
  (2) Introducing of energy in active medium such as flash of light.
(4) Mechanism of working of lasers.

Pumped energy raise electron in atom of Ruby Rod from of stable to of excited state. When such excited electron, return back, to its original orbit, stable state, it release energy in form of Photon / flash of light.

Photon induces [illegible] other electron in the other atom to rise and when when returns or normalizes release emits light.

Uni cellular
Multicellular

concave
convex

LASER

Prepared by
Muhammad Atif Ali

"The word laser stands for Light Amplification by Stimulated emission of Radiations"

Definition:

"Laser is a device which produces coherent and well organized light".

1 It was invented by T.H. Mainmah in 1960. MCQS
2 Ordinary light is made up of different colors and every color has its own wavelength.
3 In laser light all the waves of light have same color, same wave length and travel in same direction.

Different parts of Laser:

4 Active medium such as Ruby rod or CO_2 gas.
5 An arrangement of introducing energy in the active medium such as flash tube.
6 A pair of mirrors placed on either side of the active medium.
7 A cylinder or tube in which all the material is placed.

Mechanism of working of Laser:

1 Energy is first pumped into laser material.
2 This energy raises electron in an atom of ruby rod from ground state to an excited state which is unstable state for that electron.
3 It immediately falls back in its ground state from its excited state by (2) emitting the energy in the form photon (flash of light).
4 This photon induces an electron in another atom to rise from ground state to excited state, which also emits photon when returning back to its ground state.
5 This process took place at the same time in large number of atoms and remain continues.
6 Two silver mirrors, one is partially transparent in the centre reflect the photon back and forth repeatedly, induces a chain reaction of photon emission.
7 All the electrons return to ground state almost simultaneously and a power full pulse of laser light emerges from the partially transparent end of the mirror.

flare

Holography: is a three dimensional Picture Produced by laser light.

Uses of Laser light:

1. Lasers are used in telecommunication. A single beam of laser can carry thousands of radio, TV and Telephone messages.
2. Lasers are used in surveying.
3. These are used in ship navigation, vehicle guidance and missile guidance.
4. Lasers are used in surgery of eye, spinal cord and other delicate operations.
5. Dentists use laser beam to remove decay from tooth.
6. Lasers are used to initiate thermonuclear reactions.
7. Lasers are used in Holography.

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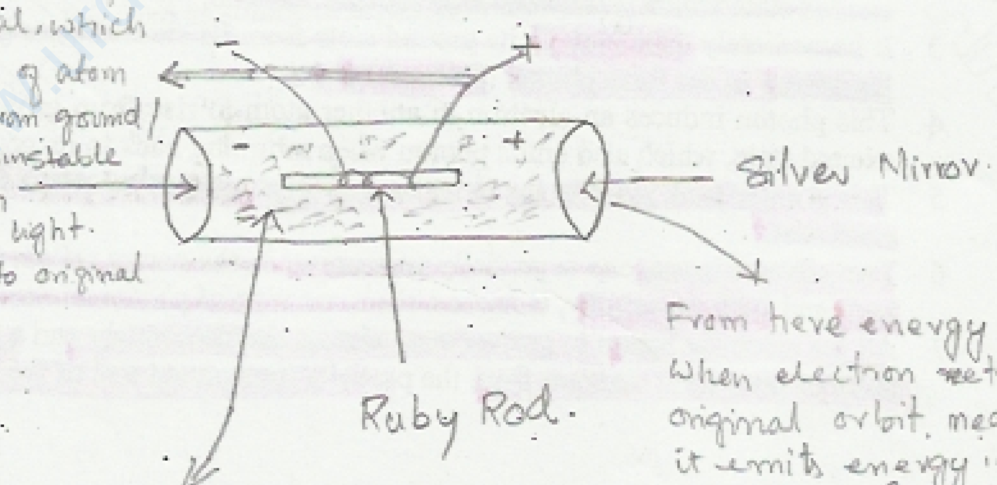
Diagram of Laser.

Energy is first Pumped into laser material, which riases electron of atom in Ruby Rod from ground/ Stable state to unstable condition. which ultimately emits light while returning to original orbit.



From here energy releases When electron retreats to original orbit, meanwhile it emits energy in the form of Photon (flash of light) which emerges ~~two~~ from Silver Mirror.

We may use carbondioxdi to Produce organized light.

"Radio Deduction And Ranging"

from atom.

Radar

Prepared by
Muhammad Atif Ali

The word Radar stands for **"Radio Detection and Ranging"**.

It was invented during the Second World War.

Transmitter generates very high frequency (electromagnetic waves)

Parts of Radar:

1 Transmitter ①
2 Receiver ③
3 Indicating devices ④
4 Antenna ②

Working of Radar:

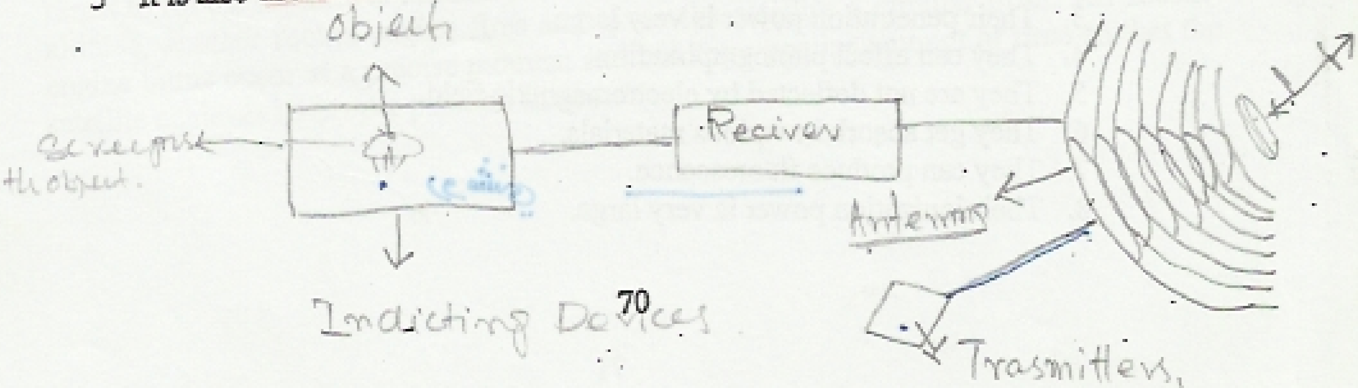
Mechanism of Radar

1 The transmitter generates very high frequency electromagnetic waves (above 600 MHz).
2 These waves are sent out in any desired direction in a narrow cone shaped beam with the help of a concave antenna.
3 The radar waves travel outward with the velocity of light and are reflected back when they strike a distant object which comes on their way.
4 These waves after reflection return and strike with the Radar antenna and are amplified in the Radar receiver.
5 Receiver sends signals to the indicating devices which measure the time taken by the radar waves to strike the object and come back.
6 By knowing the wave velocity, the distance of the object from the Radar can be found. The radar waves can penetrate through fog, haze and clouds.

Uses of Radar:

1 Radar is being used as a navigational device on ships and aero planes. (aviation)
2 It helps the pilot in landing the plane during clouds, fog etc.
3 It helps the captain of a ship to beware of other ships in the surroundings.
4 It is used to control the air traffic.
5 It is also used in weather observations and storm warnings.

Distant object.



Electromagnatic waves
Electromagnatic waves.

[electormagnatic Waves

[illegible] becomes an ion when electron is taken out from atom.

Radioactivity

Prepared by

Muhammad Atif Ali

"The phenomena in which radiations are emitted from an element is called radioactivity".

There are three types of radiations emitted by radioactive element, Alpha, Beta and gamma rays.

Properties of Radioactive rays:

Alpha Rays:

1 The charge on each Alpha particle is positive.
2 This positive charge is equal to twice the charge on a proton.
3 The mass of each alpha particle is nearly four time the mass of Hydrogen nucleus.
4 The ionization capability of alpha ray is very large.
5 The penetration power of these rays is very small.
6 These rays produce fluorescence in certain substance.
7 These rays can induce artificial radioactivity.
8 These rays produce burn and sores on human body.
9 Alpha rays get absorb after passing through a small distance in air.
10 The speed of these rays is 0.15×10^8 m/sec.
11 They are deflected by electromagnetic field.

Beta Rays:

1. These rays consist of fast moving electrons. Alpha
2. The kinetic energy of these rays is less than that of the beta rays.
3. These rays can easily produce fluoresence.
4. The ionization power of these rays is very small.
5. Their penetration power is greater than the alpha rays.
6. They can affect the photographic film.
7. The speed of these rays is 1.5×10^8 m/sec.
8. They are deflected by electromagnetic field.

Gamma Rays:

1. They do not have any charge.
2. Their velocity is equal to the velocity of light.
3. Their penetration power is very large.
4. They can affect photographic film.
5. They are not deflected by electromagnetic field.
6. They get absorb in various materials.
7. They can produce fluorescence. روشنی
8. Their ionization power is very large.

350 satellites moving around

Satellites

Prepared by
Muhammad Atif Ali

Definition:

"Satellites are those devices which are left into the orbit of the earth for specific purposes".

Explanation:

The first artificial satellite to orbit Earth was Sputnik 1. Built by the Soviet Union and launched on October 4, 1957, Sputnik had an elliptical orbit, ranging in altitude from 225 to 950 km (140 to 590 mi). Sputnik broadcast a steady signal of beeps for 21 days and burned up in Earth's atmosphere upon reentry

The Soviet Union also launched the first living creature, a dog named Laika, into space on November 3, 1957. Laika flew inside a pressurized chamber aboard the satellite Sputnik 2. She died from overheating and panic after a few hours in orbit. Sputnik 2 reentered Earth's atmosphere and burned up on April 14, 1958.

The United States launched its first satellite, Explorer 1, on January 31, 1958. Explorer 1 had a highly elliptical orbit, ranging in altitude from 360 to 2,500 km (220 to 1,600 mi).

On August 10, 1960, the United States launched a surveillance satellite, Discoverer 13 that carried the first artificial object ever retrieved from space. While Discoverer 13 remained in orbit it ejected a capsule earthward, which was then recovered by a team from the U.S. Navy.

Launch of satellite:

Satellite needs to reach an altitude of at least 200km for that altitude its speed should be 29000 to 36000 km/h. A satellite needs tremendous amount of energy to reach up to this height, which is provided by a multistage rocket engine which is attach to the satellite. This multistage rocket engine is filled with the fuel and one by one all the containers after using up their fuel left the satellite at different stages after reaching the necessary orbit. The orbit energy to satellite is provided by the photoelectric cells and the gravitational force. The rest of the launch depends on the satellite's mission. For example, if the mission requires a geostationary orbit, which can be achieved only at a distance of about 35,000 km (22,000 mi) above Earth, a third rocket stage provides the thrust to lift the satellite to its final orbital altitude. After the satellite has reached the final altitude, another rocket engine fires and gives the satellite a circular orbit. All rocket-engine burns occur at a precise moment and last for a precise amount of time so that the satellite achieves its proper position in space.

Synchronous satellite is GEO

Satellite Orbits:

GEO, stand for

A) Geostationary Equatorial Orbit:

Satellites in geostationary equatorial orbit (GEO) orbit Earth around the equator at a very specific altitude that allows them to complete one orbit in the same amount of time that it takes Earth to rotate once. As a result, these satellites stay above one point on Earth's equator at all times. The altitude of GEO is about 5.6 times the radius of Earth, or about 35,800 km (about 22,200 mi).

Research

Direct-broadcast television satellites are in GEO. A few satellites in GEO can provide coverage for the entire Earth.

B) Low Earth Orbit:

A satellite in low Earth orbit (LEO) orbits at an altitude of 2,000 km (1,200 mi) or less. Almost every satellite enters a LEO after it is launched. If a satellite's mission requires an orbit other than LEO, it uses rockets to move into its final orbit.

A low Earth orbit minimizes the amount of fuel needed. In addition, a satellite in LEO can obtain clearer surveillance images. It needs less powerful signals to communicate with Earth than satellites with higher orbits. A signal to or from a low Earth orbit also reaches its destination more quickly, making LEO satellites especially good for transmitting data.

MEO

C) Medium Earth Orbit

Medium Earth orbit (MEO) satellites orbit at an altitude about 10,000 km (about 6,000 mi) and balance the benefits and problems between LEO and GEO. The most common uses of MEO are by navigation and communication satellites.

Working of satellite:

The satellite receives the signals from the ground station and transmits it back to different receiving stations in different countries. Three satellites which are placed at an angle of 120 can cover the whole earth. The size and weight of the satellite varies.

Types of satellites:

1) Communication satellites:

These relay telephone and television signals through out the world. Almost all of the earliest satellites included some communications equipment. The National Aeronautics and Space Administration (NASA) launched the first telephone and television satellite, AT&T's Telstar 1, in 1962. The U.S. Department of Defense launched Syncom 3 in 1964. Syncom 3 was the first communication satellite to use a *geostationary orbit*—that is, an orbit that keeps the satellite over the same spot above Earth's equator.

Over 300 communications satellites have been launched since 1957.

2) **Weather satellites:**

These are those satellites which travel at high altitude and fetch observations of the atmosphere and sends pictures to the ground. They play very important role in weather forecasting and weather conditions and also foretell the storms. NASA launched the first weather satellite, Television Infrared Observation Satellite (TIROS) 1, in 1960.

3) **Navigation satellites:**

These are those satellites which are used in navigation over the sea in order to locate the position of ships in all weather and are helpful in rescue operations. The U.S. Navy launched the first navigation satellite, Transit 1B, in 1960.

4) **Scientific research satellites:**

These are used in scientific research in order to collect information about other space objects. They have given information about ozone layer, X rays and other rays coming from the sun.

Satellite orbits.
= Geostationary Equatorial orbit Geo.
= Low Earth orbit (LEO)
= Medium Earth orbit (MEO)

Types of ~~sy~~satellites.
communication satellites
weather satellites
Navigation satellites
Scientific satellites.

Electrical properties of materials

Prepared by
Muhammad Atif Ali

There are three kinds of materials on the basis of their electrical conductivity, conductors, insulators and semiconductors.

Conductors

"Those materials which allow the electricity to pass through them easily without much resistance are called conductors".

For example copper, aluminum, iron silver etc.

Insulators

"Those materials which do not allow the electricity to pass through them are called insulators".

For example rubber plastic, wood etc.

Semiconductors

"Those materials which allow electricity to pass through them only partially, they conduct electricity less than conductors but greater than insulators, are called semiconductors".

For example silicon, germanium, selenium etc.

- The electrical conductivity of semiconductors can be increased by adding some impurities in them.

Doping:

"The process in which impurities are added into the semiconductors to boost up their conducing properties is called doping".

On the basis of impurities we get two types of semiconductors, N-type and P-type semiconductors.

for example: silicon
germainum
Selenium

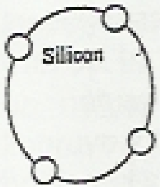
Negative
↑

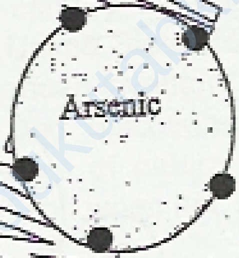
A) N-type semiconductors:

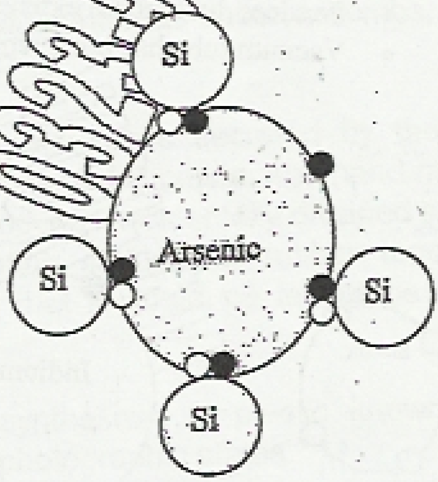
"The semiconductors which are formed due to the result of the doping of pentavalent electron donor impurities like arsenic and antimony in the silicon and germanium semiconductors are called N-type semiconductors".

Explanation:

- Pure silicon and germanium are pure insulators especially at low temperature.
- This is so, because all valance electrons form covalent bond with neighboring atoms.
- As all the valence electrons are tightly held in covalent bond, so, there is no availability of free electrons to form an electric current.
- If a silicon crystal is doped with a pentavalent element such as arsenic then four out of five valence electrons of the arsenic atom form four covalent bonds with the valence electrons of the four silicon atoms.
- The fifth valence electron of arsenic is free to move and acts as charge carriers.
- This fifth electron makes the silicon crystal a better conductor.
- This type of conductor in which pentavalent impurities are added to semiconductor is known as N-type semiconductor.







B: Positive-Type semiconductors:
It has no electron.

= Rome Temperature means low Temperature.

= covalent bond is sharing bond.

B) P-type semiconductor:

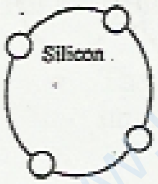
"The semiconductors which are formed due to the result of the doping of trivalent electron deficient impurities like boron and indium in the silicon and germanium semiconductors are called P-type semiconductors".

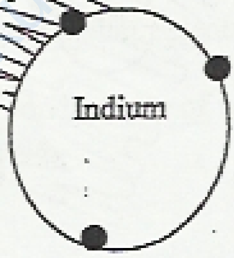
Explanation:

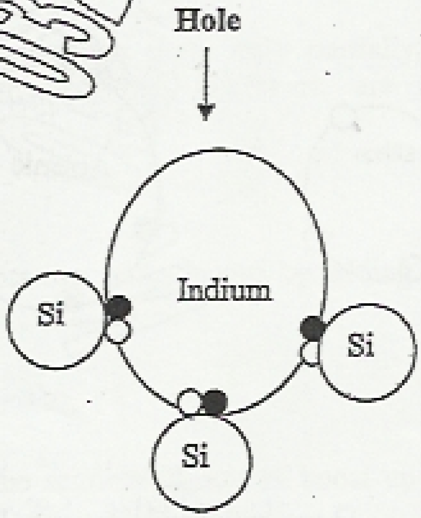
- Indium is trivalent.
- All the three valence electrons of indium form covalent bond with three neighboring valence electrons of the three atoms of silicon.
- A space called a hole is left silicon crystal due to the shortage of electrons.
- This hole behaves like positive charge and can move from place to place in the crystal on the application of potential difference which makes the silicon a better conductor.
- The semiconductor which forms as the result of the addition of trivalent element is called P-type semiconductor.

Uses of semiconductors:

- Semiconductors are extensively used in electronic devices.
- Vacuum tube has been replaced by transistors due to the use of semiconductors.







The material which contain carbon is organic [illegible] year.

Plastics

Prepared by

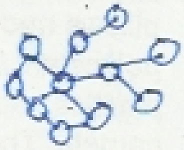
Muhammad Atif Ali

Introduction:

Plastics are synthetic organic (carbon-containing) materials that can be shaped into a variety of products under heat.

The word *plastic* is derived from the words *plasticus* (Latin for "capable of molding") and *plastikos* (Greek "to mold," or "fit for molding").

In general, materials that are made up of long, chainlike molecules are called polymers.



History of Plastics:

Humankind has been using natural plastics for thousands of years. For example, the early Egyptians soaked burial wrappings in natural resins to preserve their dead bodies. People have been using animal horns and turtle shells (which contain natural resins) for centuries to make items such as spoons, combs, and buttons.

During the mid-19th century, shellac (resinous substance secreted by the lac insect) was used in United States to make buttons, small cases, and hand-mirror frames. In 1839 American inventor Charles Goodyear accidentally dropped sulfur on natural rubber and discovered that heating sulfur and rubber together improved the properties of natural rubber so that it would no longer become brittle when cold and soft when hot.

In 1862 British chemist Alexander Parkes synthesized a plastic known as pyroxylin, which was used as a coating film on photographic plates. Mcqs.

who invented Mcqs Kisko

The following year, American inventor John W. Hyatt began working on a substitute for ivory billiard balls. Hyatt added camphor to nitrated cellulose and formed modified natural plastic called celluloid, which became the basis of the early plastics industry. Celluloid was used to make products such as umbrella handles, dental plates, toys, photographic film, and billiard balls.

These early plastics based on natural products shared numerous drawbacks. For example, many of the necessary natural materials were in short supply, and all proved difficult to mold, and most products darkened and cracked with age. Furthermore, celluloid proved to be a very flammable material.

Due to these shortcomings, scientists attempted to find more reliable plastic source materials. In 1909 American chemist Leo Hendrik Baekeland made a breakthrough when he created the first commercially successful thermosetting synthetic resin, which was called Bakelite (known today as phenolic resin). Use of Bakelite quickly grew. It has been used to make products such as telephones and pot handles. (2) Bakelite is first used commercially (1) celluliod

Uses of Plastics:

Plastics are indispensable to our modern way of life. Many people sleep on pillows and mattresses filled with a type of plastic—either cellular polyurethane or polyester. At night, people sleep under blankets and bedspreads made of acrylic plastics, and in the morning, they step out of bed onto polyester and nylon carpets. The cars we drive, the computers we use, the utensils we cook with, the recreational equipment we play with, and the houses and buildings we live and work in all include important plastic components. The average car contains almost 136 kg (almost 300 lb) of plastics—nearly 12 percent of the vehicle's overall weight. Telephones, textiles, compact discs, paints, plumbing fixtures, boats, and furniture are other domestic products made of plastics. In 1979 the volume of plastics produced in the United States surpassed the volume of domestically produced steel.

Plastics are used extensively by many key industries, including the automobile, aerospace, construction, packaging, and electrical industries. The aerospace industry uses plastics to make strategic military parts for missiles, rockets, and aircraft. Plastics are also used in specialized fields, such as the health industry, to make medical instruments, dental fillings, optical lenses, and biocompatible joints.

Characteristics of Plastics:

Note 5 marks (properties)

- They are lighter than many materials of comparable strength, because they have low density (0.9 to 2.2 g/cm^3)
- Plastics do not rust or rot.
- They can be produced in any color.
- They can be molded in any form.
- They can also be manufactured as clear as glass.
- They are waterproof.
- They are chemically resistant.
- They are insulators.

Density means

Disadvantages:

- They are non-resistance to heat.
- When burned, some plastics produce poisonous fumes.
- Plastics do not easily break down into simpler components. As a result, disposal of plastics creates a solid waste problem.

Types of Plastics:

① ②

All plastics can be divided into two groups: thermoplastics and thermosetting plastics.

Thermoplastics:

used

Thermoplastics can be repeatedly softened by heating and hardened by cooling. Following are the main types of thermoplastics.

Ethane CH_2
Methane CH_4
Propane C_2H_6
butane C_4H_8

پولی ایتھائیلین

1. Polyethylene: its uses

which does not allow light to pass.

Polyethylene (PE) resins are milky white, translucent substances derived from ethylene (CH_29CH_2).there are two types of polyethylene, Low density polyethylene (LDPE) and high density Polyethylene (HDPE). LDPE is the most widely used of all plastics, because it is inexpensive, flexible, extremely tough, and chemical-resistant. LDPE is molded into bottles, garment bags, frozen food packages, and plastic toys. (1)

High-density polyethylene (HDPE) less translucent and is molded into bags, car fuel tanks, packaging, and piping. (2)

Allow light to pass but not transparent

پولی وناٸیل

2 Polyvinyl Chloride / its uses

Polyvinyl chloride (PVC) is prepared from the organic compound vinyl chloride (CH_29CHCl). PVC is lightweight, durable, and waterproof, hard and flame-resistant. It is used to form pipe, clear bottles, compact discs and computer casings.

پولی پروپائلین

3 Polypropylene / its uses

Polypropylene is polymerized from the organic compound propylene ($CH_38CH9CH_2$). It is used to form many products, such as rope, fiber, luggage, carpet, and packaging film.

4 Polystyrene / its uses

پولی اسٹائرین

Polystyrene, produced from styrene ($C_6H_5CH9CH_2$), it is widely used because of its rigidity and superior insulation properties. It is used to form to form products such as toys, utensils, model aircraft kits, and ballpoints etc. Polystyrene is also expanded into foam plastics such as packaging materials, egg cartons, and flotation devices.

پولی ایتھائلین ٹیریفتھالیٹ

5 Polyethylene Terephthalate /its uses

Polyethylene terephthalate (PET) is formed from the reaction of terephthalic acid ($HOOC8C_6H_48COOH$) and ethylene glycol ($HOCH_28CH_2OH$). PET is used to produce films and polyester fibers, trademarked textiles Dacron, Fibre V, Fortrel, and Kodel. Tough, transparent PET films (marketed under the brand name Mylar) are magnetically coated to make both audio and video recording tape.

6 Acrylonitrile Butadiene Styrene /its uses

ایکرولونائیٹرائل بیوٹاڈین اسٹائرین

Acrylonitrile butadiene styrene (ABS) is made by polymerization of acrylonitrile (CH_2CHCN) and styrene ($C_6H_5CH9CH_2$). ABS plastic is molded to make telephones, helmets, washing machine, and pipe joints, luggage, golf carts, toys, and car grills, and pipes.

پولی امائیڈ

7 Polyamide ~~its uses~~ : NYLON

Polyamides (PA), known by the trade name Nylon, consist of highly ordered molecules, which give polyamides high tensile strength. Polyamides are made by reacting dicarboxylic acid with diamines. Some types of nylon are synthesized by the condensation of amino acids.

They are high abrasion resistance, and they are slippery. The most commonly nylon are used to form fibers, ropes, fishing lines, brushes, and heavily used in textile industries.

Thermosetting Plastics:

These are those plastics which are molded only once and cannot be remolded again. Following are the types of these plastics.

پولی یوریتھین

1 Polyurethane /its uses Poly-ure-thane

Polyurethane is a polymer consisting of the repeating unit of $[8R8OOCNH8R'8]_n$, where R may represent a different *alkyl group*. It is used to make seat cushions, mattresses, and packaging, also used as insulation in refrigerators, freezers, and homes.

فینولکس

2 Phenolics / its uses

formal-dehyde.

They are produced by reacting phenol (C_6H_5OH) with formaldehyde (HCOH). Phenolic plastics are hard, strong, inexpensive to produce, and they possess excellent electrical resistance. They are used to produce many products, such as electrical circuit boards, electrical switches, radio and television casings, etc.

میلامائین فارمل ڈی ہائیڈ - یوریا فورمل ڈی ہائیڈ

3 Melamine-Formaldehyde and Urea-Formaldehyde / its uses

As their names show, these plastics are formed by condensation reactions between urea (H_2NCONH_2) or melamine ($C_3H_6N_6$) and formaldehyde (CH_2O).

① MF plastics are more heat-resistant, scratch-proof, and stain-resistant than urea-formaldehyde plastics are. MF resins are used to manufacture dishware, electrical components, and laminated furniture.

② Urea-formaldehyde resins form products such as appliance knobs, knife handles, and plates.

پولی سیٹر پولیسٹر

4 Unsaturated Polyesters / its uses

Unsaturated polyesters (UP) belong to the polyester group of plastics. Polyesters are composed of long carbon chains containing $[8OOC8C_6H_48COO8CH_28CH_2]_n$.

They can be molded into products such as shower floors, small boat hulls, and roofing materials. Bulk molding compounds are also preformed to be compression molded into car body panels and other automobile components.

ایپوکسی

5 Epoxy / its uses

Epoxy (EP) resins are named for the epoxide groups (cycl-CH_2OCH). Epoxies are tough, extremely weather-resistant, and do not shrink as they dry.

Epoxy has important applications in the aerospace industry. All composite aircraft are made of epoxy. Epoxy is used to make the wing skins for the F-18 and F-22 fighters, as well as the horizontal stabilizer for the F-16 fighter and the B-1 bomber. In addition, almost 20 percent of the Harrier jet's total weight is composed of reinforcements bound with an epoxy matrix. Because of epoxy's chemical resistance and excellent electrical insulation properties, electrical parts such as coils, and transformers are insulated with formal-dehyde

epoxy.

[illegible]

Plastic and the environment

Every year in the United States, consumers throw millions of tons of plastic away—of the estimated 210 million metric tons (232 short tons) of municipal waste produced annually in the United States, 10.7 percent are plastics. As municipal landfills reach capacity and additional landfill space diminishes across the United States, alternative methods for reducing and disposing of wastes—including plastics—are being explored. Some of these options include reducing consumption of plastics, using biodegradable plastics, and incinerating or recycling plastic waste.

A Source Reduction

Source reduction is the practice of using less material to manufacture a product. For example, the wall thickness of many plastic and metal containers has been reduced in recent years, and some European countries have proposed to eliminate packaging that cannot be easily recycled.

B Biodegradable Plastics

Due to their molecular stability, plastics do not easily break down into simpler components. Plastics are therefore not considered biodegradable (Solid Waste Disposal). However, researchers are working to develop biodegradable plastics that will disintegrate due to bacterial action or exposure to sunlight. For example, scientists are incorporating starch molecules into some plastic resins during the manufacturing process. When these plastics are discarded, bacteria eat the starch molecules. This causes the polymer molecules to break apart, allowing the plastic to decompose. Researchers are also investigating ways to make plastics more biodegradable from exposure to sunlight. Prolonged exposure to ultraviolet radiation from the sun causes many plastics molecules to become brittle and slowly break apart. Researchers are working to create plastics that will degrade faster in sunlight, but not so fast that the plastic begins to degrade while still in use.

C Incineration

Some wastes, such as paper, plastics, wood, and other flammable materials can be burned in incinerators. The resulting ash requires much less space for disposal than the original waste would. Because incineration of plastics can produce hazardous air emissions and other pollutants, this process is strictly regulated.

D Recycling Plastics

All plastics can be recycled. Thermoplastics can be remelted and made into new products. Thermosetting plastics can be ground, commingled (mixed), and then used as filler in moldable thermoplastic materials. Highly filled and reinforced thermosetting plastics can be pulverized and used in new composite formulations.

Chemical recycling is a de-polymerization process that uses heat and chemicals to break plastic molecules down into more basic components, which can then be reused. Another process, called pyrolysis, vaporizes and condenses both thermoplastics and thermosetting plastics into hydrocarbon liquids.

Q: Define plastics (2)
Q: Types of plastic (5)
Q: characteristic (5)
Q: Note: 5/10

Definition and Types

Definition and all including

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The Universe

Prepared by

Muhammad Atif Ali

The Universe:

"The universe is the total of all that exists or has existed, both in space and time".

Universe is composed of billions of galaxies. The number of galaxies in the universe is estimated between 10^{11} to 10^{12}.

Galaxy:

"It is the fundamental unit of the universe; it is composed of hundreds of thousands of stars with gas and dust".

Classification of Galaxies:

The galaxies were classified by Hubble in 1924. According to him there are three types of galaxies.

- Elliptical galaxies.
- Spiral galaxies.
- Irregular galaxies.

Our galaxy is spiral galaxy and the name of our galaxy is The Milky Way galaxy.

The Milky Way Galaxy

- It is spiral galaxy.
- It is the member of "Local group", which contains 20 galaxies.
- Its diameter is 10^5 light years.
- It contains 10^{11} stars.
- The sun is not the largest star of the galaxy.
- The nearest galaxy to the Milky Way is Andromeda Galaxy.
- Andromeda Galaxy is 2,200,000 light years away from The Milky Way.

Light year:

"It is the distance travel by the light at the speed of 3×10^8 m/sec in one year is called the light year".

- It is approximately 9461000 million kilometer.
- It is used to measure the distance between galaxies.

3×10^8 m/sec

Astronomical unit: 1 A.U - 1 million kilometer.

"It is the distance between the earth and the sun. One astronomical unit is equal to 150 million km".
It is used to measure the distance between heavenly bodies.

Solar System

It is the tiny part of galaxy and consists of a sun and all the objects that travel around it. Our solar system includes sun, nine planets, asteroids, meteoroids, comets etc.

Planets and their characteristics:

Mercury:

- It is the nearest planet to the sun.
- Its distance from the sun is 0.387 A.U (57,900,000 km).
- Its diameter is 4880 km.
- Its rotation period is 59 earth days.
- Its year consists of 88 earth days (revolution period).
- Temperature on the mercury varies from 420°C to -180°C.
- Its mass is 0.06 times than the mass of the earth.
- It has no moon.
- It has no atmosphere.

Venus: / ~~Brightest Planet in solar system~~

- It is the 2nd planet of solar system.
- Its distance from the sun is 0.723 A.U.
- Its diameter is 12104 km.
- Its rotation period is 243 earth days.
- Its year consists of 225 earth days (revolution period).
- Temperature on the Venus is 464°C. Due to globle warming
- Its mass is 0.82 times than the mass of the earth.
- It has no moon.
- It is wrapped in thick clouds of CO_2.
- It is the nearest neighbor of the earth among the solar family.
- It is the brightest planet of solar system.

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Earth:

- It is the 3rd planet of solar system.
- Its distance from the sun is 1 A.U (149,600,000 km).
- Its diameter is 12756 km.
- Its rotation period is 24 hours.
- Its year consists of 365.25 days (revolution period).
- Average temperature on the surface of the earth is 15 °C.
- It has one moon.
- Earth surface is rich in Silicon, Aluminum, iron etc.
- It has atmosphere which consists of Nitrogen, oxygen etc.
- It is the only planet where life exists.

Mars: is Known Red Plant

- It is the 4th planet of solar system.
- Its distance from the sun is 1.5A.U (227,900,000 km).
- Its diameter is 6794 km.
- Its rotation period is 25 hours.
- Its year consists of 687 earth days (revolution period).
- Average temperature on the surface of the Mars is -63 °C.
- Its mass is 0.11 times than the mass of the earth.
- It has two moons.
- Its surface is covered with red dust.
- It is known as the Red planet.

Jupiter:

- It is the 5th planet of solar system.
- Its distance from the sun is 5.2 A.U (778,400,000 km).
- Its diameter is 140,000 km.
- Its rotation period is 10 hours.
- Its year consists of 4336 earth days (revolution period).
- Average temperature on the surface of the *Jupiter is -110* °C.
- Its mass is 318 times than the mass of the earth.
- It has 16 moons.
- Its surface is covered with clouds of Hydrogen and Helium.
- It is the largest planet of solar system.

Saturn:

- It is the 6th planet of solar system.
- Its distance from the sun is 9.5 A.U (1427,000,000 km).

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18☆

- Its diameter is 120,000 km.
- Its rotation period is 11 hours.
- Its year consists of 10760 earth days (revolution period).
- Average temperature on the surface of the Saturn is -140 °C.
- Its mass is 95 times than the mass of the earth.
- It has 18 moons.
- Its main feature is its rings, which have the appearance of a large extremely thin and circular sheet.
- It is the 2nd largest planet of solar system.

Uranus:

15☆

- It is the 7th planet of solar system.
- Its distance from the sun is 19.18 A.U (2871,000,000 km).
- Its diameter is 51,118 km.
- Its rotation period is 17 hours.
- Its year consists of 30681 earth days (revolution period).
- Average temperature on the surface of the Jupiter is -197 °C.
- Its mass is 14.5 times than the mass of the earth.
- It has 15 moons.
- Its surface is covered with Helium and Hydrogen.

Neptune:

2☆

- It is the 8th planet of solar system.
- Its distance from the sun is 30 A.U (4,498,000,000 km).
- Its diameter is 49532 km.
- Its rotation period is 16 hours.
- Its year consists of 60193 earth days (revolution period).
- Average temperature on the surface of the Neptune is -200 °C.
- Its mass is 17.2 times than the mass of the earth.
- It has 2 moons.
- It is known as the twin of Uranus due to diameter and mass similarities.

164 years of earth

Pluto:

- It is the 9th planet of solar system.
- Its distance from the sun is 34 A.U (5,900,000,000 km).
- Its diameter is 2274 km.
- Its rotation period is 6 hours.
- Its year consists of 90465 earth days (revolution period).
- Average temperature on the surface of the Pluto is -223 °C.
- Its mass is 0.002 times than the mass of the earth.
- It has 1 moon.
- It is the smallest planet of solar system.
- It is the farthest planet of solar system.

247 years of earth

Earth's Planetary Motions
Causation of Day and Night
And
Seasons

Earth exhibits two Planetry motions: rotation and revolution.

A revolution is one complete circling of the sun by the earth within its orbital path; the earth requires precisely one year to revolve around the sun. As it revolves, the earth also exhibits a second simultaneous motion – rotation or spinning on its axis. It takes the earth almost one calendar ~~year~~ to complete one full rotation on its axis, the imaginary line that extends from the North pole to the South pole through the center of the earth.

Revolution

one round = 365¼

Circular orbit =

revolves around sun.

The earth revolves around the sun in an orbit that is almost circular. Its annual revolution around the sun takes 365 ¼ days, which determines the length of our year. Rather than starting the new year at a time other than the midnight. One full day is added to the calendar every fourth year, when February has 29 days instead of 28. Such a year is called a leap year.

(Prei = helion)
(Near = sun)
Jan 3rd earth in closest to sun
Distance between earth and sun is 147.3

Like the earth which is nearly a sphere, the earth's orbital path is nearly circular around the sun. In fact, the earth is slightly closer to the sun in early January than it is in early July. This makes its orbital trajectory slightly elliptical. The average distance from the earth to the sun is approximately 150 million km (93 million miles). But on January 3rd when the earth is closest to the sun, the distance is about 147.3 million km (91.5 million mile). This position is called the position of **perihelion** (from the ancient Greek peri meaning near and Helios meaning sun). From that time onward, the earth-sun distance increases slowly until July 4, half a year later, when it reaches about 152.1 million km (94.5 miles). This position is called aphelion (ap means away). However, the total difference is not enough to produce a significant variation in the amount of solar energy received by earth.

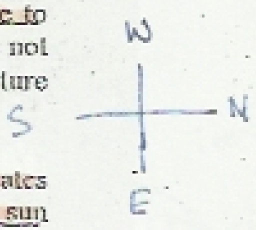
AU = 150

aphelion = ap means away = helion = from sun.

on July 4, the distance between sun and earth is 152.1 Mi

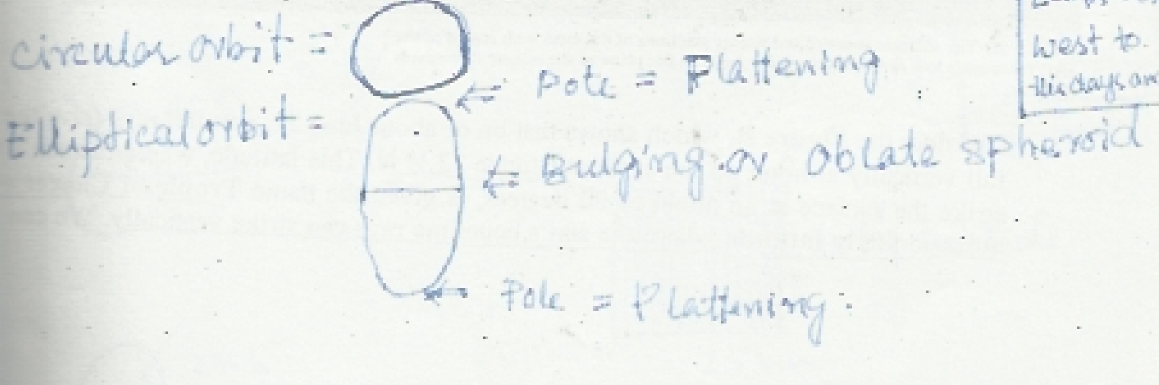
Rotation

Earth is a fast spinning planet, which produces equatorial bulging and polar flattening. Accordingly, geophysists have discovered the earth's diameter when measured pole to pole (12,715 km) slightly less than it is at the equator (12,760 km). Thus the earth is not a perfect sphere; it is an *oblate spheroid*, the technical term used to describe the departure from a sphere that is induced by the bulging and flattening.



As the earth rotates on its axis – which is in west to east direction – this motion creates the alternation of day and night, as one half of the planet is always turned towards the sun while the other half always faces away. One complete rotation roughly takes roughly 24

Earth rotates from west to East, due to the days and Nights occur



hours (23 hours , 56 minutes), or one calendar day. During one full revolution around the sun, the earth makes 365 ¼ rotations.
The earth rotates eastward, so that sunrise is always observed on the eastern horizon. If we look at earth from space directly above the North Pole, we would see it spinning it anticlockwise.

Seasonality

The imaginary plane in space, which contains the line traced by the earth's slightly elliptical orbit and the stationary sun, is called the plane of the ecliptic. The seasons occur because the earth is tilted with respect to the plane of the ecliptic.

Axial Tilt

The earth is always tilted at an angle of 66 ½ degrees to the plane of the ecliptic and is always tilted in the same direction no matter where the earth is in its orbit .the constant tilt of the axis is the key to these seasonal changes. Sometimes the term *parallelism* is used to describe this axial phenomenon, meaning the earth's axis remains parallel to itself at every position in its orbital revolution. Thus at one point ∴ in its revolution, around June 22, the northern Hemisphere receives a much greater amount of solar energy than the Southern hemisphere does. When the earth has moved to the opposite point in its orbit six months later, around December 22, the Northern Hemisphere is maximally tilted away form the sun and receives the least energy. This accounts for the seasons of heat and cold, summer and winter. (**Fig A**)

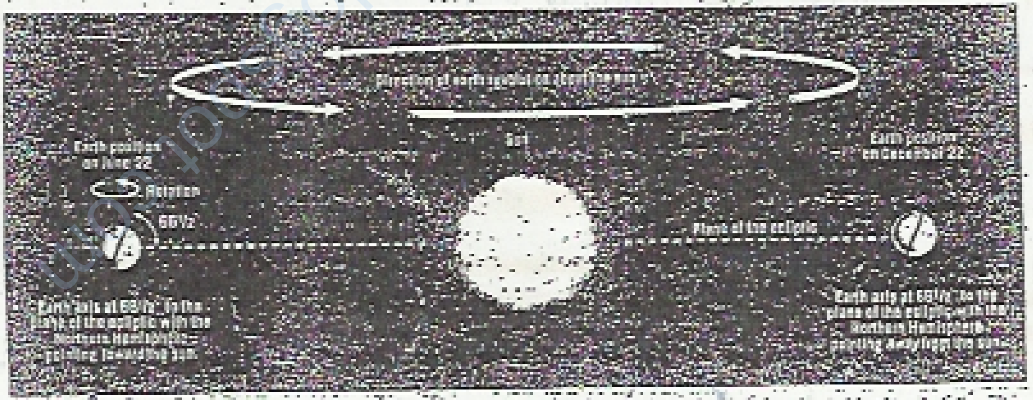

Direction of earth revolution about the sun
Sun
Earth position on June 22
Rotation
66½°
Plane of the ecliptic
Earth position on December 22
Earth axis at 66½° to the plane of the ecliptic with the Northern Hemisphere pointing toward the sun
Earth axis at 66½° to the plane of the ecliptic with the Northern Hemisphere pointing away from the sun

Fig A

FIGURE [illegible] The extreme summer and winter positions of the earth with regard to the sun. The earth's axis is tilted at the same angle to the plane of the ecliptic throughout the year.

Consider the **Figure B**, which shows that on or about June 22, parallel rays form the sun fall vertically at noon on the earth at latitude 23 ½ N. This latitude, where the sun's rays strike the surface at an angle of 90 degrees, is given the name **Tropic of Cancer** – the most northerly latitude where the sun's noontime rays can strike vertically. We can also see that all areas north of latitude 66 ½ N, which is called the Arctic Circle, remain totally in sunlight during the earth's 24-hour rotation.

Precisely six months later, on December 22, the position of the earth relative to the sun causes the sun's rays to strike vertically at noon at 23 ½ S, the latitude called the **Tropic of Capricorn** (the southernmost latitude where the sun's noon rays can strike the surface at 90 degrees). The other relationship between the earth and the sun for June 22 described above is exactly reversed. Accordingly, the entire area south of the **Antarctic circle**, located at latitude 66 ½, receives 24 hours of sunlight. Simultaneously, the area north of the Arctic Circle is in complete darkness.

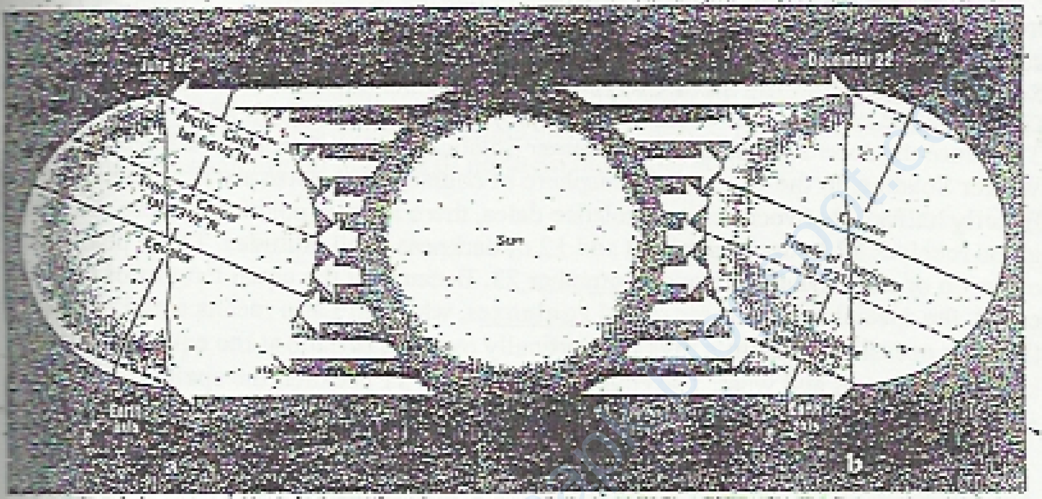
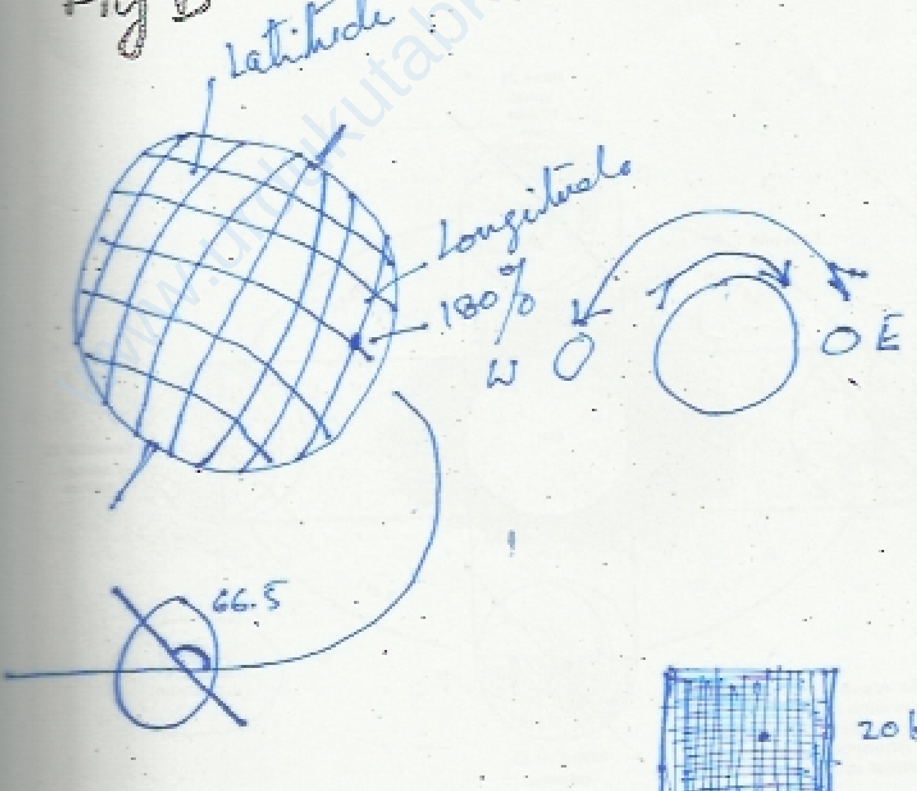

June 22
December 22
Arctic Circle (66 1/2°N)
Tropic of Cancer (23 1/2°N)
Equator
Sun
Earth axis
Cancer
Tropic of Capricorn (23 1/2°S)
Earth axis
a
b

FIGURE [illegible] The relative positions of the earth and the sun on June 22 and December 22. Points on Earth receive the sun's rays at different angles throughout the year.

Fig B


Latitude
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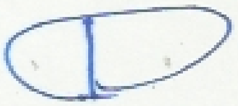
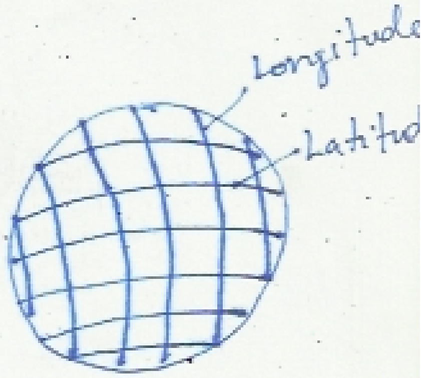
180%
W O
O E
66.5

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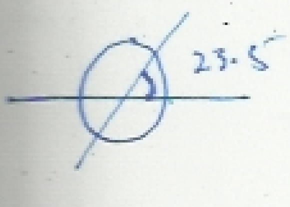
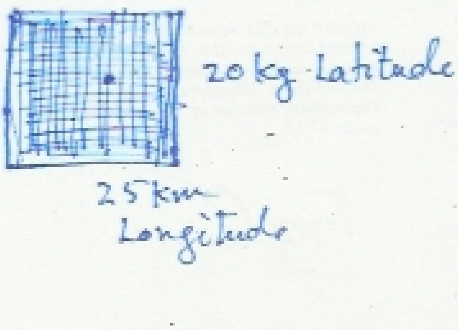
Latitude




20 kg Latitude
25 km
Longitude

Solstices and Equinoxes

To an observer on earth, it appears that the highest daily position of the sun at noontime gets lower in the sky as the season progresses from summer to fall to winter. It moves lower and lower until it stops on December 22 and then again begins to rise. Then is seems to climb higher and higher until June 22, when it would appear to stop again. South of the Equator, the dates are reversed but the phenomena is identical. The ancient Greeks called the points at which these stops occur **solstices** ("sun stand still"). Therefore the June 22 is called the Summer Solstice and the December 22 is called the Winter Solstice. In the southern hemisphere of course, these dates are reversed. Exactly halfway between the two solstice dates, there are two positions where the rotating globe receives 12 hours of sunlight and 12 of darkness at all latitudes. These positions occur on or about March 21 and September 23. Because of the equal lengths of night at every, the special positions are called **equinoxes**, which in Latin means equal nights. On ther two occasions the sun's rays fall vertically over the surface at the equator, and the sun rises due east and west. The equinoxes of March 21 is called the **spring or vernal equinox**, and that of September 23 is called the **fall or autumnal equinox.**

The Four Seasons

Imagine liking down on the earth's orbit around the sun (the plane of the ecliptic) from a point high above the solar system.(Fig. C)

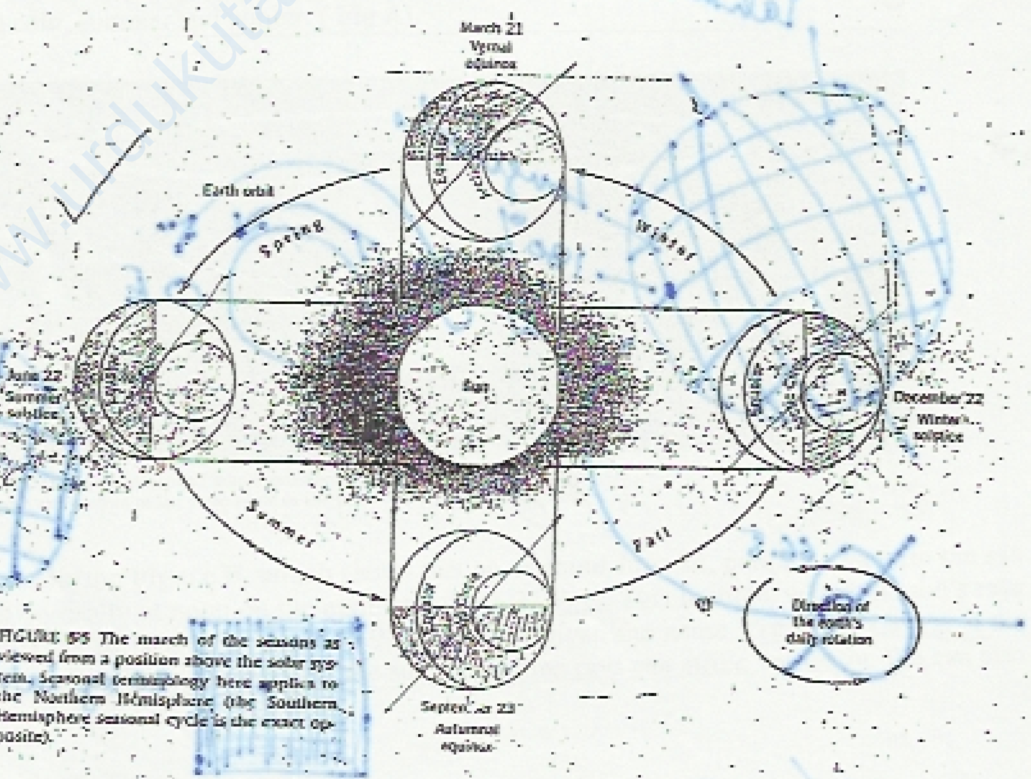

March 21
Vernal
equinox
Earth orbit
Spring
Winter
June 22
Summer
solstice
Sun
December 22
Winter
solstice
Summer
Fall
Direction of
the earth's
daily rotation
September 23
Autumnal
equinox

FIGURE 8-5 The march of the seasons as viewed from a position above the solar system. Seasonal terminology here applies to the Northern Hemisphere (the Southern Hemisphere seasonal cycle is the exact opposite).

Fig C

The North Pole always points to your right. At the summer solstice, the Arctic Circle receives sunlight during the entire daily rotation of the earth and all parts of the northern hemisphere have more than 12 hours daylight. These areas receive a large amount of solar energy in the summer season. At the winter solstice, the area inside the Arctic Circle receives no sunlight at all, and every part of the Northern Hemisphere receives less than 12 house of sunlight. Thus winter is a time of cooling, when solar energy levels are at minimum. However, at both the spring and fall equinoxes, the Arctic Circle and the equator are equally divided into day and night. Both hemispheres receive an equal amount of sunlight and darkness, and energy from the sun is equally distributed.

The annual revolution of the earth around the sun and the constant tilt of its axis give our planet its different seasons of relative warmth and coldness. Spring begins at the vernal equinox on March 21 and ends at the summer solstice on June 22; summer runs from that date through the autumnal equinox on September 23; autumn occurs form then until the arrival of the winter solstice on December 22; winter then follows and lasts until the vernal equinox is again reached on March 21. This cycle, of course, applies only to the Northern Hemisphere. The Southern Hemisphere's seasonal march is the mirror image, with spring commencing on the date of northern autumnal equinox.

Meteoroids

Prepared by
Muhammad Atif Ali

Definition: "A solid object moving in interplanetary space, of a size considerably smaller than an asteroid and considerably larger than an atom" (Inter. Astronomical Union). - Its diameter is almost 50 (No confirmed)

Meteoroids orbit around the Sun, in greatly different orbits. Some of these objects orbit together in streams; while other meteoroids are not associated with any stream clustering. These are fastest moving objects travel at roughly 42 kilometers per second (26 miles per second) through space in the vicinity of Earth's orbit.

Meteor (falling star):

"A meteor is the visible event that occurs when a meteoroid or asteroid enters Earth's atmosphere and becomes brightly visible".

This typically occurs in the mesosphere, and most visible meteors range in altitude from 75km to 100km. A very large and bright meteor is usually called a fireball. Most meteors are however, observed at night as low light conditions allow fainter meteors to be observed.

Meteorite:

"A meteorite is a portion of a meteoroid or asteroid that survives its passage through the atmosphere and collide with the ground without being destroyed".

Formation:

Many meteoroids are formed by collisions between asteroids. Other sources of meteors are known to have come from impacts on the Moon, or Mars as some meteorites from them have been identified.]

The earth gets a constant meteor shower, about 5 to 10 in an hour.

ATMOSPHERE

Prepared by
Muhammad Atif Ali

Definition: "The envelope of gases around the earth is called atmosphere".

Composition Of Atmosphere:

Percentage remains always same.

Constant Components		
	Name of Components	%age
1	Nitrogen (N_2)	78.08%
2	Oxygen (O_2)	20.95%
3	Argon (Ar)	0.93%
4	Neon, Helium, Krypton	0.0001%
Variable Components		
5	Carbon dioxide (CO_2)	0.038%
6	Water vapor (H_2O)	0-4%
7	Methane (CH_4)	*trace*
8	Sulfur dioxide (SO_2)	*trace*
9	Ozone (O_3)	*trace*
10	Nitrogen oxides (NO, NO_2)	*trace*

Nitrogen(N_2) 78.08
Oxygen (O_2) 20.9
Argon (Ar) 0.93
Neon, Helium
krypton - 0.000

Layers of Atmosphere:

Earth is divided into five major layers:

1) Troposphere: It is the first layer of earth's atmosphere

a) Height: Its height ranges from **8 to 14 km** from earths surface.

b)Temperature: It decreases with altitude, **6.5C/km.** At the end of this layer temperature reaches to -50C.

c) Major activities: Almost all weather is in this region. Clouds are formed in this region.

d) Tropopause: It is the region which separates the troposphere from the next layer--stratosphere.

Troposphere is known as the lower atmosphere.

2) Stratosphere: It is the second layer of earth's atmosphere.

a) Height: Its height ranges from 14 to 50 km from earths surface.

b) **Temperature:** Here temperature increases with altitude and reaches to 50C, due to ozone layer.

c) **Major activities:** Ozone layer is present in this region.

d) **Stratopause:** It is the region which separates the stratosphere from the next layer— mesosphere.

3) Mesosphere: It is the third layer of earth's atmosphere

a) **Height:** Its height ranges from 50 to 85 km from earths surface.

b) **Temperature:** Temperature decreases with altitude and reaches to -100C.

c) **Major activities:** Meteors born here, weather balloons are also present here.

d) **Mesopause:** It is the region which separates the mesosphere from the next layer - thermosphere.

4) Thermosphere (Ionosphere): It is the fourth layer of earth's atmosphere

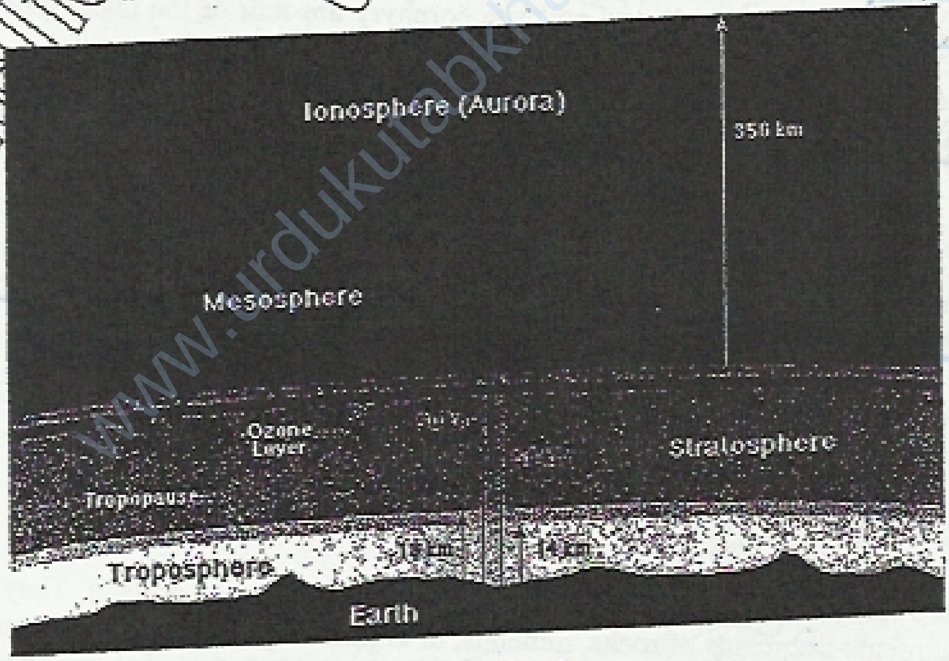
a) **Height:** Its height ranges from 85 to 800 km from earths surface.

b) **Temperature:** Temperature increases with altitude ranges from 250 to 1727C.

c) **Major activities:** Aurora and space shuttle are present in this region. Here atoms are changed into ions; this produces a huge quantity of heat.

Thermosphere is also known as the upper atmosphere

5) Exosphere: It is the last layer, from where unlimited space starts.



Types of Rocks

① Igneous Rocks:

Definition: "Igneous rocks are crystalline solids which form directly from the cooling of magma or lava".

This is an exothermic process (it loses heat) and involves a change from the liquid to the solid state. The earth is made of igneous rocks - at least at the surface where our planet is exposed to the coldness of space.

How these are formed?

These are formed from melted rock that has cooled and solidified. When rocks are buried deep within the Earth, they melt because of the high pressure and temperature; the molten rock (called magma) can then flow upward or even be erupted from a volcano onto the Earth's surface. When magma cools slowly, usually at depths of thousands of feet, crystals grow from the molten liquid, and a coarse-grained rock forms. When magma cools rapidly, usually at or near the Earth's surface, the crystals are extremely small, and a fine-grained rock results. A wide variety of rocks are formed by different cooling rates and different chemical compositions of the original magma.

Examples:

Obsidian (volcanic glass), granite, basalt, and andesite porphyry are four of the many types of igneous rock.

② Sedimentary Rocks: + secondary Rocks:

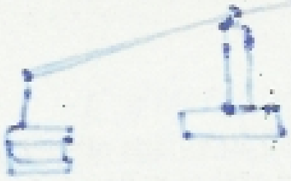
Definition:

"The rocks, which are formed when thin layer of debris and sediments get compacted and cemented, are called sedimentary rocks".

Sedimentary rocks are also called secondary rocks, because they are often the result of the accumulation of small pieces broken off of pre-existing rocks.

How these are formed?

Sedimentary rocks are formed at the surface of the Earth, either in water or on land. They are layered accumulations of sediments-fragments of rocks, minerals, or animal or plant material. Temperatures and pressures are low at the Earth's surface, and sedimentary rocks show this fact by their appearance and the minerals they contain. Most sedimentary rocks become cemented together by minerals and chemicals or are held together by electrical attraction; some, however, remain loose and unconsolidated.



Example:

Clastic, Chemical, Salt and gypsum etc.

③ Metamorphic Rocks:

The word metamorphic is the combination of two words "meta" means change and "morph" means form.

Definition: "Those rocks which can change into different forms in different environments are called metamorphic rocks".

How these are formed?

Any rock can become a metamorphic rock. All that is required for the rock is to move into an environment in which the minerals which make up the rock become unstable and out of equilibrium with the new environmental conditions. Sometime, when sedimentary and igneous rocks are subjected to intense pressure or heat, then they become metamorphic rocks. The process of Metamorphism doesn't melt the rocks, instead it transform them into denser and more compact rocks. New minerals are created by arrangement of mineral components or by reactions with fluid that enter into the rock. Pressure and temperature can even change the previously metamorphosed rocks into new type.

Examples: Common metamorphic rocks include slate, schist, gneiss, and marble.

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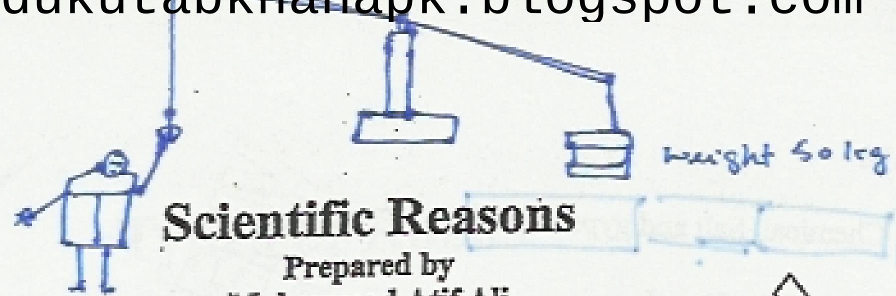
Schist: a type of Rock formed of layers of different minerals. that break naturally into thin flat Pieces

Gneiss: A type of matemorphic rock formed at high Pressure and temperature deep in the ground.



Scientific Reasons

Prepared by
Muhammad Atif Ali

Q.1. *Why it is easier to push heavy grass mover than to lift it?*

The principle of lever works in pushin pushing heavy grass mover

Ans: The principle of lever works in pushing a heavy gross mover. With the help of lever one can push or up lift heavy things easily. Another reason in pushing heavy grass mover is that you need less force to work against the force of gravity, while in up lifting you need more force to work against the force of gravity.

we need less force to work against the force of gravity.

Q.2. *Why does an electric bulb make a sudden loud noise when it is broken?*

Ans: An electric bulb has a vacuum when the bulb is broken, air rushes in vigorously from all sides and produces a loud noise.

Q.3. *A 25 watts incandescent bulb provides much less light than a 25 watts fluorescent tube light?*

Incandescent.
fluorescent

Ans: When electric current passes through the fluorescent tube the mercury gets very hot and changes to gas. A short ray is given off by the gas, which strikes against a coating of a special material inside the glass tube make the tube to glow.

Q.4. *A ball dropped vertically on the ground does not rise to its original height?*

Ans: Because all initially carried KE of the ball is converted into PE and in rebounding from earth a part of energy is also wasted and gravitational force also plays its role to prevent it from rising to its original height.

ball

Q.5. *Why meat takes longer time to cook on a mountain top than at sea level?*

Ans: At mountain atmospheric pressure is less as compare to sea level. So, more time is required to cook the meat at mountain because cooking time and atmospheric pressure are inversely proportional to each others.

inversely proportional.

Q.6. *More stirring is needed when sugar is dissolved in cold coffee than in hot coffee?*

KE ∝ Molecule

Ans: In hot coffee kinetic energy of the molecule is greater and the bonding between the molecules of the hot coffee is less as compare to the cold coffee. So it is easy to dissolve sugar in hot coffee than in cold coffee.

Q.7. Why the sun appears red at the sunset and sunrise?

Ans: Visible light consist of seven colors but we do not see them unless white light is broken down into it's a spectrum. As at the sunset and sunrise we are watching the sun more nearer to the surface of the earth, and near the surface there are always present dust particles. These dust particles screen the white light and allow only red yellow and orange colors to get through at the expense of other colors.

Q.8. Why ozone layer in the upper atmosphere is necessary for our survival?

Ans: Ozone layer prevents the ultraviolet and other high energy radiations to come on the earth. If there rays come on the earth these are highly dangerous for human beings. These can also cause skin cancer and other diseases.

radiation

↑ Plant spotting

Q.9. Why the sky appears black when view from the moon?

Ans: Because the moon has no atmosphere.

Q.10. Roads are bent inward on curves?

Ans: When a fast moving vehicle takes a curved path, it tends to move off the road. In order to prevent this, the roads are curved inward to produce necessary centripetal force which is required to keep the vehicle moving on the road. The angle of curve depends upon the radius of the curve as well as the speed of the vehicle.

Roads are curved inward to produce necessary centripetal force.

Q.11. Why water remains cool in the earth pitcher?

Ans: Water gets evaporated through the pores of the earthen pitcher. Those vapors take out heat from the water and lower down the temperature of the pitcher's water.

Q.12. Why ice and salt mixture is used as a freezing agent by making ice cream?

Ans: Salts lower down the temperature of ice by decreasing its freezing point.

Q.13. It is not advisable to sleep under trees during the night?

total eclipse.

carbondioxide oxygen

Ans: Plants at night release CO2 and take up O2. So there is less availability of O2 for respiration. It may also cause death.

Q.14. Green house operators paint their roofs white during summer?

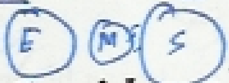
Ans: White color absorbs less light as compare to other colors. Green color absorbs more heat. In summer there is no need of green color to absorb more heat because summer are hot enough to meet the heat requirements of plants.

Q.15. Why is one's breath is visible in cold but, not in hot weather?

Ans: Because water vapors are present in breath, as temperature of our mouth is high as compare to atmosphere in winter, due to this water vapors condense when they come out of mouth and become visible in cold weather.

Q.16. Why does the total eclipse can happen only at time of the new moon?

Ans: At the time of new moon, the sun, the moon and the earth lined up. The moon comes between the earth and the sun which blocks the sun rays to fall on the earth and results in total eclipse.



Q.17. Why water boils quicker on mountain?

Ans: Because atmospheric pressure on the mountain is low as compare to plains. Whenever there is low atmospheric pressure there will be the quick boiling of water.

If we take a bottle of water temp 30° on moon & open up it cap, water will begin to boil –

Q.18. How a rainbow produced?

Ans: After the rainfall there are present droplets of water in the atmosphere. When the white light fall on the droplets, these act like a prism and split the white light into seven colors. Thus rainbow is produced

Q.19. Why lunar eclipse lasts much longer than solar eclipse?

Q.20. Why Goiter is common in people living in hilly areas.

Ans: Because there is dearth of iodine in the water in the hilly areas and iodine is most important to prevent the Goiter.

Q.21. Detergents are better cleansing agents than soap. Why?

inter molecular force b/w water molecules

Ans: Soap is basically composed of oil and fats. Both these components cannot dissolve in water so it cannot remove the intermolecular forces of water and cannot penetrate deep into the clothes due which soap is unable to remove completely the dust and other particles which are present deep into the clothes. On the other hand detergents are composed of petroleum products. When they are dissolved in water they reduce the intermolecular forces between water molecules. Therefore water containing dissolved detergents can easily enter into the clothes and clean the dust particles.

Q.22. Decomposers are important for life on land and water. Why?

Ans: Decomposers (Bacteria and Fungi) derive their energy from dead remains of animals and plants. They release the important nutrients which are tied up in the dead bodies, for recycling. The action of decomposers is important, because if it did not happen then all the nutrients would remain tied up in dead bodies and no new life would be possible without those nutrients.

Q.23. Places near the sea are cooler in summer and warmer in winter?

Ans: Water takes longer time to get heated or to get cooled. During summer the land near the sea get heated up quickly but the sea water remains cool. So, the cool breeze blowing from the sea reduces the heat in the adjoining areas. Vice versa is happened in winter.

Q.24 Colorblindness is more common in male than in females. Why?

Ans: Colorblindness is sex linked disease. Genes controlling it are recessive and are present on X chromosomes. As we know that females have XX in their sex chromosomes while male have XY chromosomes. If on both X chromosomes in female, the recessive genes of colorblindness are present then she will be colorblind. But if one chromosome has dominant gene and other has recessive then she will not be colorblind. On the other hand in male there is only one X chromosome if that chromosome contains a recessive gene of colorblindness then he will be colorblind, because there is no another X chromosome which contains the dominant gene of colorblindness which suppress the appearance of recessive gene of colorblindness.

Fet female XX chromosom
Male XY

Q.25 Light color clothes are generally worn in summer?

Ans: White or light colors clothes reflect light rays and remain cool and warm color clothes absorb light rays and remain warm. Therefore, light clothes are generally worn in summer.

Q.26 A person is hurt more when he falls on hard ground than on soft ground. Why?

Ans: There is greater force of friction on hard surface as compare to soft surface which hurts more when a person fall on it.

Q.27 Deforestation causes more floods. Why?

Ans: As forests are natural barriers in the way of flowing water, which not all stop water but also reduces its speed. When deforestation occurs these natural barriers are finished and more floods occur.

Q.28 The manhole covers are generally round. Why?

Ans: Because of following reasons
1) A round manhole cannot fall through its circle.
2) Round covers are easy to dig
3) Corners of square covers are easily broken than the round covers.
4) they are more resistant to stress than square covers.

Q.29 Rain water is more fertile than tube well water. Why?

Ans: Rain water contains nitrogen which is useful for plant growth. Where as tube well water contains impurities which are harmful for plants.

Q.30 Why clothes of a moving dancer bulge?

Ans: There is vacuum inside the clothes of dancer, when dancer moves in circle air enter into that vacuum which bulges her clothes.

Q.31 People are advised not to stand near a fast moving train. Why?

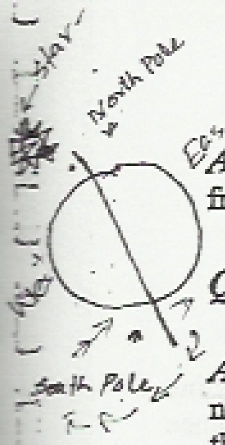
Ans: When a fast moving train passes near, air pressure decreases in front of him while behind him pressure remains same, thus man can fall towards train.

Q.32 The image of a tree looks inverted on the bank of a lake. Why?

Ans: This is due to the law of reflection according to which image which is formed is always inverted but at the same distance.

Q.33 Why the pole star is seen in the north?

There is vacuum inside the clothes of dancer, when dancer moves in circle air enter into that vacuum which bulge the her clothes



Ans: Pole star is present above the north pole and earth rotates from the west to east not from the north to south. That is why it is always seen from north pole.

Q 34 We never see birds urinating. Why?

uric acid which needs less water

Ans: Birds use less water than animals. They secrete uric acid instead of ammonia which needs less water for its secretion. So, they excrete their metabolic waste products along their feces because they are facing the deficiency of water.

Q.35 Pasteurized milk has more nourishment than ordinary boiled milk. Why?

Ans: Pasteurized milk is heated at 68 to 72 C for thirty minutes. In this process harmful bacteria are killed, but the nature of fats and proteins remain unchanged at this temperature. On the other hand milk is boiled at 100 C. This temperature not only killed the beneficial bacteria but also changed the nature of fats and proteins.

Q.36 Bees die when they sting human beings. Why?

Ans. When a bee stings human beings, the pouch full of poison ruptures in the mouth of bee. That poison not only enter in the body of human beings but also in the body of bee. So, due to its own poison, bee dies.

Q.37 Cloudy nights are usually warmer than the clear night. Why?

Ans: During cloudy nights the CO2 gets accumulated beneath the clouds. In nights the earth radiates heat energy which it has absorbed during the day in the form of infra red radiations. CO2 does not let the infra red to escape and absorb them which in turn warms the atmosphere. when the sky is clear, heat radiated by earth is dispersed into atmosphere, thus clear nights become cooler.

Q.38 Why do some people snore?

Ans: The cause of snoring is due to blockage in the respiratory passage which may be caused by different reasons. When the air flow becomes irregular due to blockage the soft palate start flapping which produce the snore sound.

soft palate: the roof of the mouth, separating the oral and nasal cavities

Q.39 Why do we sometimes sleep walk?

Ans: There are two main reasons of sleep walk

1) Inherited factor

Soft Palate: The posterior fleshy portion of the roof of the mouth. it forms a movable muscular flap that seals off the nasopharynx during swallowing and speech.

Palate: Taste
Palette: painting
Pallet: platform

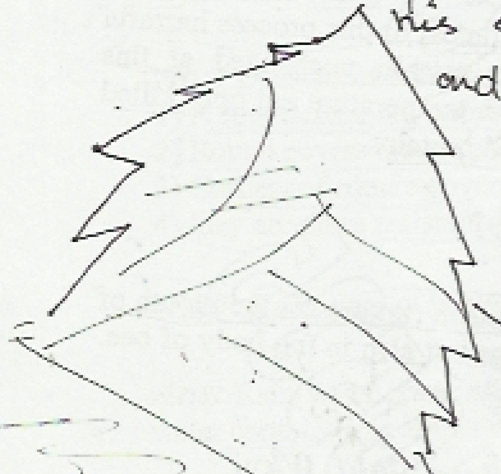
not able to verbalise.

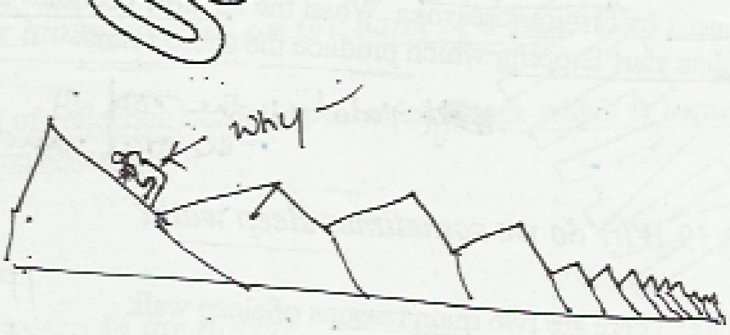
2) Inner conflicts, which are not able to verbalize
It is more common in children and with the passage of age it decreases.

Q.40 Climber bends forward while climbing a mountain. Why?

Ans: by bending forward he increases the base of support, so that the vertical line passing through his centre of gravity may fall within the base and also it helps to balance the body.

by bending forward he increases the base of support, so that the vertical line passing through his centre of gravity may fall within the base and also it helps to balance the body.





Definitions

Prepared by

Muhammad Atif Ali

Instructions:

These questions are frequently asked in exams and each of them carries 2 marks. This material is more than sufficient for two marks.

Radiotherapy:

It is a technique in which high energy radiations from X rays, gamma rays and other sources of radiations are used to kill cancer cells. There are two types of radiotherapy, internal and external. In internal radiotherapy radioactive isotopes are placed inside the body while in external radiotherapy radioactive isotopes are placed outside the body of patient.

Medicine.

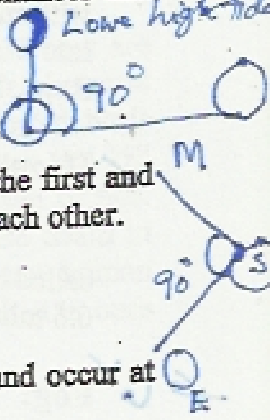
Chemotherapy:

It is a technique in which chemicals are used to destroy cancerous cells. Chemotherapy has its side effects because it can also destroy other cells. In this technique chemicals are taken orally and then those chemical dissolve in blood to reach their target areas. But as we know that there are cells present in the blood, and there are chances that those blood cells may also be affected. That's why it is dangerous.

Related

⇒ ### Neaptides:

Neaptides are also called lower high tides. These tides occur during the first and last quarter phases of the moon, when the moon and sun are at right angle to each other.



⇒ ### Springtides:

#

Springtides are also called high tides. They rise at the highest point and occur at the time of full moon.

Neon signs:

Neon sign are cathode ray tubes in which neon gas is filled. When electricity is passed through that tube containing neon gas it emits an orange red color ray which is known as neon gas.

and industrial

Magnetic resonance imaging: (MRI)

It is a technique which is used in medicine to produce image of tissues to diagnose some diseases, disorders and injuries. It enables the doctors to identify abnormal tissues without opening the body through surgery. MRI does not expose the patient to radiation, but uses a power full magnetic field to produce the images of bones and organs. It should not be used on people with metal implants.

Supersonics:

MCQs

The speed of aircraft is greater than the speed of sound then it is known as supersonic. The speed of the sound depends upon the medium through which sound passes. In dry air at 0 C the speed of the sound is about 1225 km/h. Now in these days supersonic aircrafts are used for transportation purposes. Due to supersonic aircrafts shock waves are produced similar to the bow waves of fast moving ships. Shock waves produce sonic boom which are very distressing to the people living near supersonic routes.

Medicine

Fluorescent light:

The light emitted by a source made up of glass tube internally coated with fluorescent material and filled with mercury vapers is called fluorescent light. When suitable voltages are applied across the electrodes, an electron beam emits which strikes with mercury atoms which in turn emit ultraviolet radiation. This radiation is converted into visible light by fluorescent material coated inside the tube. It gives a fluorescent flow.

Haze:

A cloud of dust, smoke and other particles that reduce visibility close to earth is called haze. A haze is said to be exist when visibility is less than 1.25 miles but more than 0.6 mile.

Fog:

Fine particles of water suspended in the lower atmosphere. It is very close to the earth surface. It occurs in winter especially in during the months of December and January.

Smog:

It is a mixture of solid and liquid fog and particles of smoke. It also reduces visibility and it occurs mostly in coastal areas. and industrial.

Nucleon:

Those sub-atomic particles which make up the nucleus of an atom are collectively called nucleon. As protons and neutrons are present in the nucleus of an atom, they are actually collectively called nucleon.

Photon:

When an electron jump from an orbit of higher energy level to the orbit of lower energy level, then it emits light in the form of packets of energy, these packets of energy are called Photons. The energy of photon depends upon the difference in energy level of two orbits.

Cusec:

It is the short hand of Cubic feet per second. It is used to measure flow of river. The average value of one cusec is equal to 28.31 liters. It is actually used to know how much water flow in a river in one second.

Theodolite:

It is actually an instrument that is used by surveyors to measure angles and direction during their survey of land. It gives more precise readings than any other instrument. A telescope is attached with it, which gives accurate sighting in any direction.

Bird Flue:

Bird flu is an infection caused by an Avian Influenza Virus. These viruses are naturally present in some birds in their intestine, but they usually do not get sick because they have natural immunity against bird flu. But there are certain domesticated birds which don't have natural immunity against bird flu it cause them sick and even can kill them. Bird flu is highly contagious disease it can transfer from birds to human beings. There is no immunity in human beings against avian virus. It may even cause death in human beings. It is an epidemic disease. Only precautionary measures can save human from this disease, because there is no medicine available in market which is used to cure this disease.

Plaster of Paris:

It is actually Calcium Sulphate. When it is mixed with water it forms a paste which solidifies and dries up. It cannot re-dissolve in water. It is used to make models and designs. It is also used to rejoin the broken parts.

calcium sulphate + water = plaster of paris.

Pedometer:

$CaSO_4$

It is a small instrument used to measure the distance a person walks. It looks like a watch and is carried in the pocket. With each step, the motion of body causes a small lever in the pedometer to move. This lever records the number of steps taken. To, find out how for a person has walked, average length of that person's step should be taken and then multiply it with the number of recorded steps.

Shock Waves:

Shock waves are strong pressure waves with very high intensity which build around the aircraft when its speed is more than the speed of sound. This speed creates disturbance in the air around the aircraft. This disturbance in the air travels towards the ground with a great speed in the form of shock waves. When these shock waves reach to the ground they produce a great sound of high intensity, which are very distressing to the people living at the ground in those areas.

Super Fluid:

Super fluid is the one which does not conduct heat, does not exert force on the walls of the container and it lacks viscosity. The molecules of one portion of the fluid do not offer any resistance in the flowing of molecules of other portion of the fluid. This type of fluid does not exist, but there are fluids which have low viscosity and conduct heat in very low quantity.

#

Aqua Regia:

It is a solution which is the combination of Hydrochloric acid (HCL) and Nitric acid (HNO3) in the ratio of 3: 1. It was discovered by a Muslim scientist Jabber Bin Hayan. This solution has the ability to dissolve the hardest metals like Platinum, Gold etc.

Pelage:

It is the arrangement of hairs on the body of different animals especially mammals. Different mammals have different arrangements of hairs on their bodies; we can say that they have different pelage.

Plumage:

This term is used for birds. It is the arrangement of feathers on the body of birds. As we know that feathers are of different colors and types, and they are also arranged differently so, different species of birds have different plumage.

Nuclear Radiations:

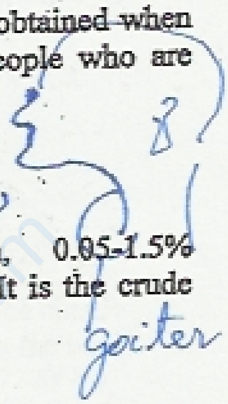
The radiations which are produced in the result of nuclear reactions such as nuclear fission or nuclear fusion are called nuclear radiations. These are very dangerous and carry very high energy. These can cause different diseases when these fall on the body of human beings, such as skin cancer, cataract, mutation in different cells etc.

table salt.

Iodized Salt:

NaCl + KI = Iodized salt

The salt which contains iodine in it is known as iodized salt. It is obtained when Potassium iodide is mixed in ordinary salt. It is very useful for the people who are suffering from goiter disease.



ریت

Pig iron:

The iron which contains impurities like 3-4% Carbon, 1/2% Silicon, 0.05-1.5% Phosphorous, 0.5-1% Manganese, 0.05-0.1% Sulpher is called pig iron. It is the crude form of iron. It is easily breakable.

Cast iron:

It is also impure form of iron. It contains impurities like 2-3% Carbon and 1.5% other impurities like Phosphorous, Manganese, and Sulpher etc.

✓ Wrought iron: — Mcqs.

It is pure form of iron. It also contains some impurities but they are present in very less amount. Carbon and Manganese seldom exceeds 0.25% and 0.06% respectively. It is soft and can be changed easily into steel.

Steel:

.25 to 2
Iron + carbon + Mgnese + Chromium + vanadium + Tegston

It is an alloy of iron, 0.25-2% carbon and other elements like Manganese, Chromium, Vanadium and Tungsten.
It is durable and free from rusting.

✓ # Stainless Steel:

It is a special alloy of Iron, Chromium and Nickel. It is corrosion resistant. It is used in making machine parts, cables etc.

Mcqs.

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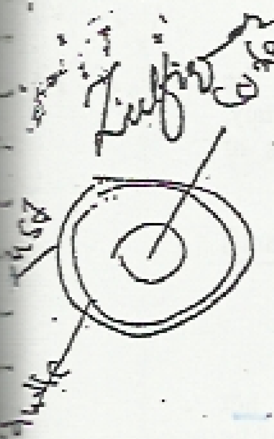
Zulfiqar A



Geothermal Energy

Prepared by

Muhammad Atif Ali

Introduction:

It is energy, which contain intense heat that continually flows outward from deep within Earth. This heat originates primarily in the core. Some heat is generated in the crust, the planet's outer layer, by the decay of radioactive elements that are in all rocks. The crust, which is about 5 to 75 km (about 3 to 47 mi) thick, insulates the surface from the hot interior, which at the core may reach temperatures from 4000° to 7000° C (7200° to 12,600° F). Where the heat is concentrated near the surface, it can be used as a source of energy.

Explanation:

The distance from Earth's surface to its center is about 6,500 km (about 4,000 mi). From Earth's surface down through the crust, the normal temperature gradient (the increase of temperature with increase of depth) is 10° to 30° C per km (29° to 87°F per mi). Underlying the crust is the mantle, which is made of partially molten rock. Temperatures in the mantle may reach 3700° C (6700° F).

Geothermal Reservoirs:

In certain areas, water seeping down through cracks and fissures in the crust comes in contact with this hot rock and is heated to high temperatures. Some of this heated water circulates back to the surface. However, the rising hot water may remain underground in areas of permeable hot rock, forming geothermal reservoirs. Geothermal reservoirs, which may reach temperatures of more than 350° C (700° F), can provide a powerful source of energy.

Geothermal power plants:

Geothermal reservoirs within about 5 km (about 3 mi) of Earth's surface can be reached by drilling a well. The hot water or steam from wells can be used to turn turbine generators to produce electricity. A power plant that uses this natural source of hot water or steam is called a geothermal power plant.

At the beginning of the 21st century, there were some 380 geothermal power plants in 22 countries around the world with a combined installed capacity of about 8,000 megawatts.

Dirlling a Well

Geothermal energy provided 1.6 percent of the world's total electricity, serving the electricity needs of about 60 million people. The United States, the Philippines, Italy, Mexico, Indonesia, Japan, New Zealand, and Iceland are the largest producers of geothermal energy.

There are three types of geothermal power plants: flash steam plants, dry steam plants, and binary plants.

A) Flash Steam Plants:

Most operating geothermal power plants are flash steam plants. In a flash steam plant, hot water from wells is piped into the plant, where, released from the high pressure of its underground location; some of the hot water boils (flashes) to steam, which is used to spin a turbine generator, which produces electricity. After turning the turbine, the geothermal water, along with the condensed steam, is piped back down into the reservoir to be reheated so it can be used again.

B) Dry Steam Plants:

While most geothermal reservoirs produce hot water, a small number produce mostly steam. Steam from such a reservoir is used in a dry steam plant. In such a plant, the steam is piped directly through a turbine generator.

The first geothermal power plant, built at Larderello, Italy, in 1904, was a dry steam plant. The Larderello steam field is still producing electricity today. The largest producing dry steam geothermal reservoir in the world is located at The Geysers Geothermal Field in northern California; it produces 1000 megawatt of electricity.

Reservoir.

R8 Reservoir.

Reservior.

viov

C) Binary Power Plants:

In a binary power plant, heat from geothermal water is transferred through heat exchangers to a second liquid (called a working fluid, usually isobutane) contained in adjacent but separate pipes. Heat transferred from the geothermal water converts this low-boiling point working fluid into vapor, which powers a turbine generator.

Direct use of Geothermal water:

In addition to generating electricity, geothermal water is used directly

- To heat greenhouses.
- To speed the growth of fish and prawns.
- The heat from geothermal water is used for industrial processes.
- It is used for space heating in homes and other buildings.

People in over 35 countries have developed geothermal water for such purposes.

Geothermal energy and environment:

- Compared to other types of power plants, geothermal plants have relatively little effect on the environment. Geothermal power plants have been successfully operated in farm fields, in sensitive desert environments, and in forested recreation areas.
- Hydrogen sulfide gas ($\overset{\text{Dangerous}}{\downarrow}$ H_2S), which can be toxic at very high concentrations, is sometimes present in geothermal reservoirs. However, this gas is removed from geothermal water with antipollution "scrubbing" equipment.
- Geothermal reservoirs contain some carbon dioxide (CO_2), which is released when the hot water turns into steam. The amount of carbon dioxide released from geothermal power plants, however, ranges from zero to 4 percent of the carbon dioxide released by an equivalent power plant fueled by coal or petroleum.

FERTILIZERS

Prepared by
Muhammad Atif Ali

Definition:

The chemical substances used to increase the fertility of soil.

Classification:

Fertilizers are classified according to their source, constituents and made of action.

1) Classification according to their Sources:

(a) **Natural fertilizers:** These are present naturally. These are rich in organic components. For example green manure, dung of animals, organic manure of garbage.

(b) **Synthetic fertilizers:** These are synthesized on commercial scale. These are synthesized according to the need of elements. Examples are urea, super phosphate, calcium super phosphate etc.

2) Classification according to Constituents:

Fertilizers are classified according to constituents into following types:

NPK ضرور ہوگا

(a) **Primary fertilizers:** The fertilizers which have essential elements like, Nitrogen, Phosphorous and Potassium are called primary fertilizers.

(b) **Secondary fertilizers:** The fertilizers which have essential elements along with other elements like sulfur, manganese, carbon, hydrogen, etc are called secondary fertilizers.

[illegible] ✓

NPK + sulfur, manganese, carbon hydrogen etc

3) Classification according to mode of action:

Fertilizers are divided into following forms according to their mode of action:

(a) **Directs fertilizers:** The fertilizers which are directly absorbed by plants are called direct fertilizers.

(b) **Indirect fertilizers:** The fertilizers which are mixed inside the soil and increase its fertility and then these are taken up by plants through their roots. ~~dissolving in water.~~

4) Classification according to elements:

These fertilizers are divided into following types:

(a) **Nitrogen fertilizers:** These fertilizers having nitrogen as essential are called nitrogen fertilizers. Example is urea.

(b) **Phosphorous fertilizers:** The fertilizers which have phosphorous as essential elements. For example: super phosphate and triple super phosphate.

(c) **Mixed fertilizers:** The fertilizers which have nitrogen phosphorous and potassium are called mixed fertilizers, e.g. Dicalcium, Diamonium phosphate.

Advantages of fertilizers:

Following are the advantages of fertilizers:

1. Fertility
2. Plant growth
3. Soil structure

Characteristics of fertilizers:

Following are the main characteristics of the fertilizers:

1. Non-volatile
2. Non-residual
3. Friendly for environment
4. Fulfill demand of plant
5. Non-poisonous

NUCLEAR REACTOR

An assembly or arrangement within which nuclear reactions are carried out

In a nuclear power station nuclear reactor plays the same part as furnace plays in a thermal power station. Coal or oil is burnt to produce heat in furnace, while controlled fission reaction produces heat in nuclear reactor.

Fission reaction

Splitting up of heavy nucleus into two smaller nuclei of roughly equal size along with the emission of energy is called fission reaction.

Fission reaction of ${}_{92}U^{235}$ (Uranium) can be represented as:-

$${}_{92}U^{235} + {}_{0}n^{1} \longrightarrow {}_{56}Ba^{141} + {}_{36}Kr^{92} + 3{}_{0}n^{1} + Q$$

Q is the energy given out in this nuclear reaction.

Basic principles

Energy is produced at the rate of 210 Mev(Mega electronvolt) per atom of uranium. The fast moving fission fragments besides colliding with one another also collide with other uranium atoms thus causing the fission of other uranium atoms. Also heat is produced by their collision with other uranium atoms. This heat produces steam which in turn rotates the turbine. Turbine rotates the generator which produces electricity.

Parts of reactor

There are usually four parts of nuclear reactor

1. Core
2. Moderator
3. Control rods
4. Turbine & Generator

Core

- It is the most important part.
- Fuel is placed in the core in the shape of cylindrical tubes.
- Reactor fuel is of various types i.e. uranium, plutonium etc.

Moderator

- Fuel rods are placed in a substance of small atomic weight, such as water, heavy water, carbon or hydrocarbon etc. These are called moderators.

- Function of the moderator is to slow down the neutrons produced in the fission reaction and to direct them towards the fuel .

Control Rods

- Cadmium or boron rods are used to limit the number of neutrons. They have the ability to absorb fast moving neutrons. As it is desired that out of three neutrons produced only one should cause fission of another uranium atom.

Turbine & Generator

- Heat is produced in the core of reactor. Temperature rises to 1200C^{o} Steam is produced by transportation of heat which is done by heat exchanger. In the heat exchanger steam is produce from ordinary water. Steam is then used to turn the turbine, which in turn rotates the generator to produce electricity.

Demerit

- In the used up fuel intensely radioactive substance remains. The half lives of these radioactive remnant materials are may be thousand years. Radiations emitted by this nuclear waste are very harmful and injurious to the living things. Unfortunately there is no proper arrangement of their disposal. Best place so far found to store these waste is in the bottom of old salt mines, which are very dry and are thousands of meters below the surface of earth. Here they can remain and decay without polluting the environment but this method is very expensive.

[redacted]

[redacted]

CONTRIBUTION OF MUSLIM SCIENTISTS IN THE DEVELOPMENT OF SCIENCE.

INTRODUCTION:

It is open truth that the scientific advancement in the modern world is deeply rooted in the scientific achievements of the Muslim world in the Middle Ages. It is fully recognized that the modern science originally belongs to Islamic spirit of enquiry and it is the result of dedicated services of the Muslim scientists and it has deep roots in the Islamic Culture. During middle ages the Muslim intellectuals made an astonishing advancement in the every field of science and arts. They became the masters of science, arts and learning. The Muslim scientists greatly contributed in medicine, surgery, astronomy, mathematics, Algebra, botany, physics, chemistry and many other fields of science.

Following are the main Legendary figures of Muslim science and their contribution is given as under.

1 MUHAMMAD BIN MUSA AL-KHAWARIZIMI (780-847 AD)

Muhamamd bin Musa al-Khawarizimi popularly known as al-Khawarizimi was born in Khawarizim. He was a great mathematician, astronomer, musician, geographer and historian. His major contribution in the field of science is summarized as under.

- (i) He was the first person who used zero.
- (ii) He compiled the oldest astronomical tables and composed oldest works on arithmetic and algebra.
- (iii) He wrote famous book titled "Hisab-al-Jabar Wal Muqabala, in which he gave analytical solutions of linear and quadratic equations.
- (iv) In geography, he wrote an outstanding book named 'Kitab-Surat-al-Ard', which gives an idea about the shape of the earth.
- (v) He also wrote a famous book on history known as 'Kitab al-Tarik.'
- (vi) He introduced the method of counting based on numerals and the decimal system for the first time.
- (vii) He composed his own astronomical tables known as Zijj (ZJ), which became a model for astronomical pursuits in East and West.

2 JABIR IBN HAYAN: (721-815 AD).

Jabir ibn Hayan, popularly known as Geber in the West was a legendary figure in the field of Chemistry. He made an amazing advancement in chemistry, for which he is known as the 'Father of Chemistry.' His chief contribution in the field of science is highlighted as under.

[redacted]

(i) He prepared a number of important chemicals, which are still used in the modern world. These chemicals included;

- Nitric acid
- Sulphuric acid
- Hydrochloric acid
- White lead

(ii) He introduced new chemical techniques and processes, which included,

- Calcination
- Crystallization
- Reduction
- Distillation &
- Sublimation

(iii) He gave a sound theory about geological formation of metals.

(iv) He prepared basic lead carbonate, arsenic and antimony from their sulfides.

(v) He is author of book named "Composition of Alchemy", which is an authentic book on chemistry.

(vi) He also wrote books like: Book of seventy, Kitab al-Tajmi and Kitab al-Rahmah.

3 ZAKRIYA AL-RAZI: (865-925 AD)

Abu Bakr Muhammad Ibn Zakariya al-Razi was born at Rayy. He was the greatest physician of the Islamic world . His main fields of interest were medicine, physics, chemistry, philosophy etc. His major contribution in science is outlined as under;

(i) Al-Hawi: Al-Hawi is a monumental work of al-Razi. It is the most comprehensive encyclopedia of medicine in 20 volumes.

(ii) He wrote a monograph on 'Diseases in Children' for which he earned the title of "Father of Pediatrics."

(iii) He wrote a book named "Al-Judari wal Hasbah", in which he gave a detailed view of small pox and measles diseases.

(iv) In chemistry he classified chemical substances and wrote a book named 'Kitab al-Asrar", which deals with preparation of chemicals and their application.

(v) He was the first person who recognized the reaction of the pupil to the light.

(vi) He was the first person who used animal gut as ligature for surgical operations.

(vii) He for the first time used opium as an anaesthetic during surgery.

(viii) His other famous books are: Kitab al-Mansuri, Arabian medicine and Barr-ul-Saat.

347 billions

[redacted]

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4 ABU ALI IBN-E-SINA: (980-1037 AD).

Ibne-Sina was born at Afsinah in 980 A.D. He was a legendary figure in medical sciences. He also contributed in the fields of philosophy, geology, mathematics and astronomy. His major contribution in the field of science is as under:

(i) He wrote a famous book named 'Al-Qanun', in which he discussed human physiology and medicine.

(ii) He was the first to use catheters made of the skins of animals and he mentioned intravesical injections by means of a silver syringe.

(iii) He is considered as "Father of Geology." He wrote a book on mountains, earth's interior and gave the scientific reasons for earth-quakes.

(iv) His other famous books are; Al-Shifa, An-Najat and Isharrat.

5 IBN AL-HAITHAM: (965-1039 A.D).

Abu Ali Al Hasan Ibn al-Haitham was born at Basrah in 965 AD. He was a renowned mathematician and physicist of his age. His contribution to science is as under:

(i) His fame lies in his book named "Kitab-al-Manazir" which is on optics. In this book he described the nature of light and the phenomenon of vision.

(ii) He was the first scientist who elaborated two laws of reflection of light.

(iii) Pinhole camera used for formation of images was constructed by him.

(iv) He was the first person who declared that light is a form of energy

(v) He discovered magnifying lenses.

(vi) He gave idea that Retina is the major part of eye, responsible for vision.

(vii) He identified gravity as a force, a theory which was later on developed by Newton.

6 IBN AL-BAITAR:

Ibn al-Baitar a great botanist, pharmacist was born in Malaga. He achieved a lot of success in botany and pharmacology. His major contribution to science was as under:

(i) He classified and gave names to plant kingdom over which modern botany is based.

(ii) He gathered herbs and new plants from Spain to Syria and extracted medicines from them.

(iii) He laid foundation of herbal medicine.

(iv) He wrote an encyclopedia in Botany named 'Kitab al-Jami fi Adwiya al-Mufrada", in which 1400 medical drugs are described.

(v) "Kitab al-Mughani fil Adwiya al-Mufrada" is another masterpiece of his work. It consists of 20 chapters dealing with diseases of head, eye, ear, cosmetics and fever.

7 AL-BIRUNI: (973-1050 AD)

Abu Rayhan Muhammad Al-Biruni was born near Khawarizm in 973 A.D. He was a prolific writer. His fields of interest were astronomy, medicine, mathematics, geography and history. His major contribution as a scientist was as under:

- (i) He explained the problems of advanced trigonometry.
- (ii) He gave theory that light travels faster than sound.
- (iii) He described and explained fully the concept of longitude and latitude.
- (iv) He wrote "Kitab-al-Saidanas", which explained different medicines.
- (v) He wrote a book on different types of gems and stones, named 'Kitab-al-Jawahar.'
- (vi) He wrote a book on history named "Tahqiq al-Hind", which contain a comprehensive and accurate account of history and social conditions of India in 11th century.
- (vii) He gave idea that earth is not stationery but it rotates on its axis.
- (viii) His other famous books are al-Tafhim, Qanun al-Masudi, Asrar al-Baqiya etc.

8 IBN RUSHD:

Ibn Rushd, popularly known as Averroes in the West was born at Cordova (Spain). He was a great philosopher, jurist and physician. He was an authority on Fiqh. He investigated astronomy and discovered the sunspots. His most celebrated works are as under:

- (i) Tahafut Al-Tahafut.
- (ii) Kitab Fasl Al-Maqal.
- (iii) Kitab Fi Karkal Al Falak.
- (iv) Kitab Al Lashf Al Manahij.

9 NASIR-UD-DIN TOOSI:

He was born in 1201 at Toos (Iran). He was a Muslim philosopher, mathematician and scientist. His main works are given below:

- (i) He built an observatory for astronomical research at Maragha.
- (ii) He wrote "The Ilkhanian Tables" a work on mathematics, which is divided into four books:
  - (a) Chinese, Greek, Arabic and Persian Chronology.
  - (b) Motions of the planets.
  - (c) Ephermeride and
  - (d) Astronomical observations.
- (iii) He wrote famous books like, Kitab al-Fusul, Kitab al-Tahsil and Kitab Shakl al-Qatta.

[redacted]

[redacted]

10 ABU ISHAQ AL KINDI:

Al-Kindi was a great Muslim philosopher and the physicist. He was born at Basrah. He is popularly known as the 'Philosopher of the Arabs.' He greatly contributed in the fields of physics, optics, meteorology and music. His most important work was on the reflection of light. He discussed music from scientific point of view. Besides sound and music he did valuable work on geometrical optics. His most important scientific works were;

(i) De Medicinarum compositarium Grabidus, which deals with medicine.
(ii) De Aspectibus, which is a treatise on geometrical and physiological optics.

He also explained the laws related to the gravitational fall of the bodies.

11 AL-BATTANI:

Al-Battani was a great astronomer and mathematician. In mathematics, he introduced the use of sines in the mathematical calculations, computed a table of contingents, and formulated certain propositions in spherical trignoinetry. His astronomical works published De Motu Stellarum which were concerned with motion of the stars, corrected the errors of the Alexandrian astronomer Ptolemy in regard to the inclination of the ecliptic and the length of year—His famous book was "Kitab al-Zig."

12 UMMAR AL-KHAYYAM: (1044-1123 A.D.)

Ummar al-Khayyam was born in Nishapur. He was a mathematician, astronomer and philosopher. His chief contribution in the fields of various subjects is as under:

(i) He was the first person who proved binomial theorem.
(ii) He classified algebraic equations.
(iii) He introduced the Jalali Calendar.
(iv) He developed accurate methods for determination of specific gravity.
(v) He recognized 13 different forms of cubic equations and arranged them in the order of their complexity depending on the number of terms involved.

13 ABUL WAFA MUHAMMAD AL-BUZJANI (940-988)

Abdul Wafa Muhammad Al-Buzjani was born in Nishapur. Later on he migrated to Baghdad in 959 A.D. His major contribution in the field of science was as under:

(i) His major contribution was in the field of mathematics
(ii) He gave the solution of many problems of geometry & trigonometry
(iii) He provided a totally new method of constructing
(iv) He also gave knowledge about the movements of the moon

14 ALI BIN RABBAN TUBRI (775-870 A.D)

He was born in Tubristan. He was great scientist of his age. His contribution in science can be summarized as under:

(i) He greatly contributed in the fields of Zoology, psychology, philosophy & astronomy.
(ii) His famous book was "Firdaus-ul-Hikma".

[redacted]

15 ZIA-UD-DIN AL-DA[redacted]

(i) He was the greatest Zoologist and greatly contributed in the filed of zoology.

(ii) He wrote famous book called "Hayat-al-Haywan", or the life of animals. This book gives knowledge about thousands of animals.

(iii) He also classified the plants.

16 DR. ABDUL QADEER KHAN

The greatest Scientist and the pioneer of Pakistan nuclear power, Dr. Abdul Qadeeer Khan was born on 1st April, 1936 at Bhopal in India. He received his early education in India. For higher studies, he went to Holland and got degree of MSC and he was appointed as a research assistant. He received Phd degree form University of Leaven (Belgium). His achievements can be summarized as under.

(i) He was appointed as an expert at Urenco Enrichment Plant, Holland.

(ii) He laid the foundation of Pakistan nuclear power and the former engineering lab at Kahuta was renamed was Abdul Qadeer Khan Laboratories.

(iii) It was the result of his efforts that Pakistan become the first Muslim nuclear state on 28th May, 1998.

17 DR. ABDUL SALAM

Dr. Abdul Salam is the prominent scientist of Pakistan. He was born in Jhang in 1926. He got degree of Msc from Government college and worked as lecturer there. Then he went to England for higher education, where he carried out research in the filed of theoretical physics. He gave the theory of subatomic 'N' particles and unification of forces for which he was awarded Noble Prize in 1979. He established an institute for theoretical physics in Trieste, Italy. He died in 1997.

Following are the questions of CSS [redacted] instruments and their uses in various forms;

1. What can be measured by the following instruments; (CSS-1984).

i)	Hygrometer.	ii)	Barometer.
iii)	Lactometer.	iv)	Udometer.
v)	Polarimeter.	vi)	Tonometer.
vii)	Ammeter.	viii)	Ammeter.
ix)	Tachometer.	x)	Thermometer.

2. What are the uses of following instruments. Answer any five! (CSS-1987)

a)	Chronometer	e)	Lactometer.
b)	Gyroscope	f)	Periscope.
c)	Barometer	g)	Seismometer.
d)	Galvanometer	h)	Tachometer.

3. What are the uses of following instruments: (CSS-1989)

i)	Galvanometer	vi)	Seismometer
ii)	Gyroscope	vii)	Ammeter
iii)	Lactometer	viii)	Tachometer.
iv)	Spectrophotometer	ix)	Geiger counter
v)	Periscope	x)	Seismometer.

50 to be remembered

Scientific Instruments

SCIENTIFIC INSTRUMENTS AND THEIR FUNCTIONS

	INSTRUMENT	FUNCTION OF INSTRUMENT
1. ✓	Actinometer	It is used for measuring direct heating power of the Sun.
2. ✓	Altimeter	It shows altitude, especially in airplanes.
3. ✓	Ammeter	It measures strength of an electric current.
4. ✓	Algesimeter	It measures the sensitivity of skin.
5. ✓	Anemometer	It measures velocity and direction of the wind.
6.	Aneriodograph	It records atmospheric pressure.
7.	Audiometer	It is used for improving hearing power.
8.	Barometer	It measures atmospheric pressure.
9.	Barograph	It is a self-recording barometer which records atmospheric pressure.
10.	Ballistic Galvanometer	It measures total quantity of electricity of a momentary current in a circuit.
11.	Betatran	It accelerates electrons.

64 TM

12.	**Binocular**	It magnifies view of the distant objects.
13.	**Burette:**	It is used for measuring volume of a liquid.
14.	**Calorimeter**	It measures quantity of heat.
15.	**Colorimeter**	It compares intensities of colours.
16.	**Chronometer**	It is used to measure longitude of a vessel over sea.
17.	**Cyamometer**	For measuring blueness of oceans and sky.
18.	**Commutator**	It is used to change direction of an electric current.
19.	**Carburetor**	It is a device in the internal combustion petrol engine for mixing air and petrol vapour.
20.	**Cardiograph**	It is an instrument which records pattern of heart beats.
21.	**Cardiogram**	It is the record of heart beats i.e. pattern etc.,
22.	**Clinical Thermometer**	It measure the temperature of human body.
23.	**Computer**	It is an electronic machine which computes or processes given data according to the set of instructions.
24.	**Cyclotron**	It is an apparatus, for the acceleration of charged atomic and subatomic particles revolving in a magnetic filed.
25.	**Dynamos**	It converts mechanical energy into electric energy.
26.	**Decimeter**	It measures density of glass.
27.	**Dynamometer**	It measures electric power.
✓ 28.	**Densitometer**	It is used for measuring density of spectrum lines. ✓
✓ 29.	**Drinker's apparatus**	This instrument revives artificial respiration. ✓
30.	**Electroscope**	It detects the presence of electric charge.
31.	**EEG** discover	It stands for Electro-Encephalograph. This instrument records electric currents produced by Cerebral Cortex.
32.	**Electrometer**	It measure voltage differences.
33.	**Electron microscope**	It magnifies the images of minute objects which cannot be seen with a naked eye.
34.	**Eudiometer**	It is a glass tube which measures volume changes in a chemical reaction between gases.
35.	**Electron multipleier**	It detects very small quantities of light radiation.
36.	**Fathometer**	An instrument which records depth of the oceans.
37.	**Galvanometer**	It measures small electric currents.
38.	**Goniometer**	It measures angles between crystal surfaces.
39.	**Gyroscope**	It is a rotating wheel whose axis is free to turn but maintains a fixed direction unless perturbed, esp. used for with the compass in an aircraft, ship etc.
40.	**Hydrometer**	It is used to determine relative density of liquids.

41.	Hydrophone	Used to measure sound under water
42.	Hygrometer	It measures relative humidity in atmosphere.
43.	Hygroscope	It shows changes in atmospheric humidity.
44.	Hypsometer	It measures altitude of a place by determining the boiling point of water.
45.	Interferometer	This instrument divides a beam of light into several beams and again unite them.
46.	Keratometer	Instrument used to measure corneal astigmatism.
47.	Kipp's apparatus	This apparatus produces such gases in a laboratory, which can be produced by the chemical action of a liquid on a solid directly.
48.	Lactometer	It is used for measuring relative density of milk.
49.	Magnetometer	It is used to compare magnetic moments and fields.
50.	Manometer	It measures pressure of gases.
51.	Mariner's Compass	It is used in navigation and shows direction.
52.	Magneto	It ignites petrol vapour in a petrol internal combustion engine.
53.	Micrometer	Used to measure small distances and angles.
54.	Microscope	It magnifies the small objects.
55.	Motor	It converts electric or chemical energy into mechanical energy.
56.	Oscilloscope	Instrument for providing visible images of one or more electrical quantities varying rapidly with time.
57.	Periscope	This instrument is used in submarines, for viewing objects above eye or head level of observes.
58.	Photometer	It is used for comparing the luminous intensity of source of light.
59.	Pyroheliometer	Used for measuring solar radiation.
60.	Pyrometer	Used for measuring higher temperatures.
61.	Photo-electric Cell	Used for detecting and measuring light.
62.	Pipette	It is a glass tube, which is used for definite volume of liquid.
63.	Potentiometer	It is used for measuring potential difference of direct electromagnetic field.
64.	Quadrant	This instrument is used in astronomy and navigation for measuring altitude and angles.
65.	Quartz Clock	It is a highly accurate clock, used in astronomical observations.
66.	Refractrometer	It measures refractive index of a material.

Saturday 26-June

Test Topics

Instruments - 50 - 35 = 15 ⇒ Difficult.

Scientist - 10 ⇒ 10 to 10 ⇒ Easy to understand.

Units - 50

[redacted]

67.	Radio-micrometer	It is used for measurement of heat radiation.
68.	Rain-gauge	It measures quantity of rainfall.
69.	Resistance-Thermometer	It is a thermometer, which determines electrical resistance of a conductor.
70.	Radar	It locates angle and direction of an aircraft flying within the range of the instrument.
71.	Radiator	It is attached to the car engine and acts as a cooling agent by radiating heat generated by the engine.
72.	Salinometer	It determines salinity of water.
73.	Sextant	Used to measure angular distance between two objects.
74.	Spectroscope	It is used for spectrum analysis.
75.	Spectrometer	It is used for precise measurement of refractive indices.
76.	Seismograph	It records earthquake intensity.
77.	Sphygmomanometer	Used for blood pressure.
78.	Stereoscope	Device for producing a three-dimensional effects by viewing two slightly different photograph together.
79.	Stethoscope	It is used for hearing heart beat and lung sounds.
80.	Saccharimeter	It determines sweetness or sugar content of a solution.
81.	Spherometer	Used for measuring curvatures of spherical objects.
82.	Stroboscope	Instrument for viewing the objects moving rapidly with a periodic motion and to see them as if they were at rest.
83.	Tangent Galvanometer	Used for measuring strength of direct current.
84.	Telemeter	It records physical events happening at a distance.
85.	Telstar	It transmits wireless or TV broadcast across continents via space.
86.	Thermometer	It is used to measure temperature.
87.	Teleprinter	It is used to record telegraphic messages.
88.	Telescope	It is used for viewing distant objects as magnified.
89.	Television	Instrument which transmits the visible moving images by means of wireless waves.
90.	Thermocouple	A temperature measuring device.
91.	Thermopile	Instrument used for the measurement and detection of heat radiation.
92.	Thermostat	It is used for maintaining a constant temperature.
93.	Transistor	It is used to amplify current.

94.	Ultramicroscopie	It is used for magnifying minute objects which cannot be seen with ordinary microscope.
95.	Vernier Callipre	Used for measuring sub-divisions of a scale.
96.	Viscometer	Used for measuring viscosity.
97.	Voltameter	Electrolyte cell for conducting electrolytic dissociation of electrolytes.
98.	Voltammeter	For measurement of potential difference between two points.
99.	Wet and dry bulb Hygrometer	It is a kind of hygrometer which measures relative humidity of atmosphere.
100.	Wimshurst machine	An apparatus used to generate static electricity.
101.	Audiophone	Used for improving weak hearing.
102.	Aerometer	It measures flow of air.
103.	Anchor	It is used for keeping ships standstill in water.
104.	Auxanometer	It measure growth in plants.
105.	Parachute	It retards speed of falling objects.
106.	Radiometer	It measures radiant energy.
107.	Radiograph	This instrument converts rays into mechanical energy.
108.	Siren	Used for loud sound.
109.	Kaleidoscope	It is an optical instrument which is used for checking coloured pattern.
110.	Lucimeter	Used to measure intensity of light.
111.	Hectograph	It is a duplicating machine.
112.	Heliscope	It is used for viewing the Sun.
113.	Halcometer	This device is used for small celestial distances.
114.	Tachometer	Instrument measuring velocity or rate of rotation of a shaft.
115.	Watt meter	For measurement of potential difference.
116.	Geiger Counter	It is a device used for detecting and measuring radioactivity.

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WEIGHTS AND MEASURES UNITS

	Quantity	SI Units	Symbol
1	absorbed radiation dose	gray	Gy
2	amount of substance	mole[1]	mol
3	electric capacitance	farad	F
4	electric charge	coulomb	C
5	electric conductance	siemens	S
6	electric current	ampere[1]	A
7	energy or work	joule	J
8	force	newton	N
9	frequency	hertz	Hz
10	illuminance	lux	lx
11	inductance	henry	H
12	length	meter[1]	m
13	luminous flux	lumen	lm
14	luminous intensity	candela[1]	cd
15	magnetic flux	weber	Wb
16	magnetic flux density	tesla	T
17	mass	kilogram[1]	kg
18	plane angle	radian	rad
19	potential difference	volt	V
20	power	watt	W
21	pressure	pascal	Pa
22	radiation dose equivalent	sievert	Sv
23	radiation exposure	roentgen	R
24	radioactivity	becquerel	Bq
25	resistance	ohm	Ω
26	solid angle	steradian	sr
27	sound intensity	decibel	dB
28	temperature	°Celsius	°C
29	temperature, thermodynamic	kelvin[1]	K
30	time	second[1]	s

1) SI base unit.

~~Meters per second into Feet per second~~	~~3,281~~
~~Kilometres per hour into Miles per hour~~	~~0,621~~

~~POWER~~

~~To convert~~	~~Multiply by~~
~~Kilowatts into horsepower~~	~~1.341~~
~~Metric horsepower into horsepower~~	~~0.98632~~
~~Metric horsepower into Foot Pounds-force per second~~	~~542.48~~

~~FORCE~~

~~To convert~~	~~Multiply by~~
~~Newtons into pounds Force~~	~~0.2248~~
~~Newtons into poundals~~	~~7.2330~~

Weights and Measures Units

Unit	Definition
31 acoustic ohm	cgs unit of acoustic impedance (the ratio of sound pressure on a surface to sound flux through the surface)
32 acre	traditional English land measure; 1 acre = 4,480 sq yd (4,047 sq m or 0.4047 ha)
33 acre-foot	unit sometimes used to measure large volumes of water such as reservoirs; 1 acre-foot = 1,233.5 cu m/43,560 cu ft
34 astronomical unit	unit (symbol AU) equal to the mean distance of the earth from the sun: 149,597,870 km/92,955,808 mi
35 atmosphere	unit of pressure (abbreviation atm); 1 standard atmosphere = 101,325 Pa
36 barn	unit of area, especially the cross-sectional area of an atomic nucleus; 1 barn = 10^{-28} sq m
37 barrel	unit of liquid capacity; the volume of a barrel depends on the liquid being measured and the country and state laws. In the United States, 1 barrel of oil = 42 gal (159 l/34.97 imperial gal), but for federal taxing of fermented liquor (such as beer), 1 barrel = 31 gal (117.35 l/25.81 imperial gal). Many states fix a 36-gallon barrel for cistern measurement and federal law uses a 40-gallon barrel to measure & ldquo; proof spirits.&rdquo; 1 barrel of beer in the UK = 163.66 l (43.23 U.S. gal/36 imperial gal)
38 base box	imperial unit of area used in metal plating; 1 base box = 20.232 sq m/31,360 sq in
39 baud	unit of electrical signalling speed equal to 1 pulse per second
40 brewster	unit (symbol B) for measuring reaction of optical materials to stress
41 British thermal unit	imperial unit of heat (symbol Btu); 1 Btu = approximately 1,055 J
42 bushel	measure of dry and (in the UK) liquid volume. 1 bushel (struck measure) = 8 dry U.S. gallons (64 dry U.S. pt/35.239 l/2,150.42 cu in). 1 heaped U.S. bushel = 1.278 bushels, struck measure (81.78 dry pt/45.027 l/2,747.715 cu in), often referred to as 1¼ bushels, struck measure. In the UK, 1 bushel = 8 imperial gallons (64 imperial pt); 1 UK bushel = 1.03 U.S. bushels
43 cable	unit of length used on ships, taken as 1/10 of a nautical mile (185.2 m/607.6 ft)
44 calorie	cgs unit of heat, now replaced by the joule; 1 calorie = 4.1868 J
45 carat	unit for measuring mass of precious stones; 1 carat = 0.2 g/0.00705 oz
46 carat	unit of purity in gold; pure gold is 24-carat
47 carcel	obsolete unit of luminous intensity
48 cental	name for the short hundredweight; 1 cental = 45.36 kg/100 lb
49 chaldron	obsolete unit measuring capacity; 1 chaldron = 1.309 cu m/46,237 cu ft
50 clausius	in engineering, a unit of entropy; defined as the ratio of energy to temperature above absolute zero.

NOTABLE INVENTIONS AND DISCOVERIES

Date	Invention or Discovery	Inventor or Discoverer	Nationality
1250	Magnifying glass	Roger Bacon	English
1450	Printing press	Johann Gutenberg	German
1504	Pocket watch	Peter Henlein	German
1590	Compound microscope	Zacharias Janssen	Dutch
1593	Water thermometer	Galileo	Italian
1608	Telescope	Hans Lippershey	Dutch
1625	Blood transfusion	Jean-Baptiste Denys	French
1629	Steam turbine	Giovanni Branca	Italian
1642	Adding machine	Blaise Pascal	French
1643	Barometer	Evangelista Torricelli	Italian
1650	Air pump	Otto von Guericke	German
1656	Pendulum clock	Christiaan Huygens	Dutch
1661	Methanol	Robert Boyle	Irish
1668	Reflecting telescope	Isaac Newton	English
1671	Calculating machine	Gottfried Wilhelm Leibniz	German
1698	Steam pump	Thomas Savery	English
1701	Seed drill	Jethro Tull	English
1710	Piano	Bartolomeo Cristofori	Italian
1712	Steam engine	Thomas Newcomen	British
1714	Mercury thermometer	Daniel Gabriel Fahrenheit	German
1717	Diving bell	Edmund Halley	English
1725	Stereotyping	William Ged	Scottish
1745	Leyden jar (condenser)	E.G. von Kleist	German
1752	Lightning rod	Benjamin Franklin	American
1758	Achromatic lens	John Dollond	British
1759	Marine chronometer	John Harrison	British
1764	Spinning jenny	James Hargreaves	British
1769	Spinning frame	R. Arkwright	English
1769	Steam engine (with separate condenser)	James Watt	British
1769	Automobile	Nicholas-Joseph Cugnot	French

1775	Submarine	David Bushnell	American
1780	Steel pen	Samuel Harrison	English
1780	Bifocal lens	Benjamin Franklin	American
1783	Balloon	Joseph Michel Montgolfier and Jacques Étienne Montgolfier	French
1784	Threshing machine	Andrew Meikle	British
1785	Power loom	Edmund Cartwright	British
1786	Steamboat	John Fitch	American
1788	Flyball governor	James Watt	British
1791	Gas turbine	John Barber	British
1792	Illuminating gas	William Murdock	Scottish
1793	Cotton gin	Eli Whitney	American
1795	Hydraulic press	Joseph Bramah	English
1796	Lithography	Aloys Senefelder	German
1796	Smallpox vaccination	Edward Jenner	British
1799	Fourdrinier machine (papermaking)	Louis Robert	French
1800	Jacquard loom	Joseph Marie Jacquard	French
1800	Electric battery	Count Alessandro Volta	Italian
1801	Pattern loom	Joseph Marie Jacquard	French
1804	Screw propeller	John Stevens	American
1804	Solid-fuel rocket	William Congreve	British
1804	Steam locomotive	Richard Trevithick	British
1805	Electroplating	Luigi Gasparo Brugnatelli	Italian
1810	Food preservation (by sterilization and exclusion of air)	François Appert	French
1810	Printing press	Frederick Koenig	German
1814	Railroad locomotive	George Stephenson	British
1815	Safety lamp	Sir Humphry Davy	British
1816	Bicycle (no pedals)	Karl D. Sauerbronn	German
1819	Stethoscope	René-Théophile-Hyacinthe Laënnec	French
1820	Hygrometer	J.F. Daniell	English
1820	Galvanometer	Johann Salomo Cristoph Schweigger	German
1821	Electric motor	Michael Faraday	British
1823	Silicon	Jöns Jakob Berzelius	Swedish
1823	Electromagnet	William Sturgeon	British
1824	Portland cement	Joseph Aspdin	British
1827	Friction match	John Walker	British
1829	Typewriter	W.A. Burt	American
1829	Braille printing	Louis Braille	French
1830	Platform scales	Thaddeus Fairbanks	American
1830	Sewing machine	Barthélemy Thimonnier	French
1831	Phosphorus match	Charles Sauria	French

1831	Reaper	Cyrus Hall McCormick	American
1831	Dynamo	Michael Faraday	British
1834	Electric streetcar	Thomas Davenport	American
1835	Pistol (revolver)	Samuel Colt	American
1837	Telegraph	Samuel Finley Breese Morse Sir Charles Wheatstone	American British
1838	Morse code	Samuel Finley Breese Morse	American
1839	Photography	Louis Jacques Mandé Daguerre and Joseph Nicéphore Niepce William Henry Fox Talbot	French British
1839	Vulcanized rubber	Charles Goodyear	American
1839	Steam hammer	James Nasmyth	Scottish
1839	Bicycle (with pedals)	Kirkpatrick MacMillan	British
1845	Pneumatic tire	Robert William Thompson	American
1846	Rotary printing press	Richard March Hoe	American
1846	Nitroglycerin	Ascanio Sobrero	Italian
1846	Guncotton	Christian Friedrich Schönbein	German
1846	Ether	Crawford Williamson Long	American
1849	Reinforced concrete	F.J. Monier	French
1849	Safety pin	Walter Hunt	American
1849	Water turbine	James Bicheno Francis	American
1850	Mercerized cotton	John Mercer	British
1851	Breech-loading rifle	Edward Maynard	American
1851	Opthalmoscope	Hermann Ludwig Ferdinand von Helmholtz	German
1852	Nonrigid airship	Henri Giffard	French
1852	Elevator (with brakes)	Elisha Graves Otis	American
1852	Gyroscope	Jean Bernard Léon Foucault	French
1855	Hypodermic syringe	Alexander Wood	Scottish
1855	Safety matches	J.E. Lundstrom	Swedish
1856	Bessemer converter (steel)	Sir Henry Bessemer	British
1858	Harvester	Charles and William Marsh	American
1859	Spectroscope	Gustav Robert Kirchhoff and Robert Wilhelm Bunsen	German
1860	Gas engine	Jean-Joseph-Étienne Lenoir	French
1861	Web-fed newspaper printing press	Richard March Hoe	American
1861	Electric furnace	Wilhelm Siemens	British
1861	Machine gun	Richard Jordan Gatling	American
1861	Kinematoscope	Coleman Sellers	American
1865	Antiseptic surgery	Joseph Lister	English
1866	Paper (from wood pulp, sulphite process)	Benjamin Chew Tilghman	American
1866	Dynamite	Alfred Bernhard Nobel	Swedish
1868	Dry cell	Georges Leclanché	French